

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

MONTHLY BULLETIN
OF AGRICULTURAL INTELLIGENCE
AND PLANT DISEASES

AR IV - NUMBER 12

DECEMBER 1913



In quoting articles, please mention this BULLETIN.

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Bulletin pages are marked (Bd.).

FIRST PART,
ORIGINAL ARTICLES

**The Work of the Imperial Institute for the Economic Development
of the British Colonies and India**

by

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The Imperial Institute is organised by the British Government with the Cooperation of the Governments of the British Dominions, Crown Colonies and India, to assist economic development, more especially of the own Colonies and India, by arranging for general information comprehensive exhibits explaining and illustrating the agricultural and other natural resources of these countries and by conducting enquiries and investigations, required by the local agricultural and other technical departments, and furnishing information respecting the economic possibilities and value of raw materials, especially of new or little known products, manufacturers, merchants and other enquirers at home.

The first of these branches of work is carried on through the Public Galleries of the Institute in which all the Countries of the Empire are represented by collections of their principal economic products; by maps and diagrams explanatory of their industries and trade; and by photographs, pictures and other exhibits illustrative of their present condition. In these Galleries visitors are admitted without charge. Each section of the Collections is in charge of a Technical Superintendent who is accessible to visitors and who receives enquiries respecting the Colonies and their resources which are replied to verbally or by letter. In the centre of the Galleries is a Stand for the distribution of literature relating to the Colonies and the Colonies to applicants for special information of all kinds relating to these countries. Last year the number of visitors to the Public Galleries was 205 503 and 17 545 publications were supplied to enquirers from the Central Stand. The visitors include the general public,

students from schools and other educational institutions in London and throughout the home country, who are specially conducted through sections of the Galleries and the features of each section explained; other visitors are commercial men, intending settlers, etc., who are in search of special information respecting particular countries and their possibilities. The Galleries thus provide an economic conspectus of the resources of the British Empire.

The Central Gallery is occupied by exhibits from South Africa, the West Indies, the Mediterranean Possessions and Australasia; the Eastern Gallery by those of Canada, which extend into the North Gallery; the Western Gallery by those of the Straits Settlements and Malay States, Ceylon and India. The native industries of India are shown in the Indian Pavilion, whilst a Pavilion for Ceylon will be opened next year. The North Gallery contains the exhibits of Hong Kong, East and West Africa, Uganda, Nyasaland, Mauritius, Seychelles, the Sudan and Newfoundland and a part of those of Canada. All the important agricultural products of India and the British Colonies are exhibited with explanatory labels, whilst for purposes of comparison a collection of the standard commercial products used in British Industries is separately shown in the East Upper Gallery.

The Scientific and Technical Research Department of the Institute includes a large staff of investigators and an extensive series of laboratories, working rooms and reference collections of products. Its chief business is to collect and distribute information respecting the natural products, vegetable and mineral, and the industrial possibilities of each country of the Empire and to conduct, in co-operation with manufacturers and merchants, scientific and technical enquiries and investigations with a view to the utilisation of new or little-known products and the introduction to Commerce. Many of these enquiries and investigations are initiated by the Agricultural Departments abroad and by manufacturers and others at home. Every year several hundred reports are made, chiefly to the Governments of the Colonies, respecting the commercial value of every class of natural product and the methods of producing and preparing it for the market. The Department therefore assists Agricultural Departments in the Colonies by conducting investigations which can only be successfully undertaken by specially trained investigators, those which require co-operation with manufacturers and other experts at home. Last year the methods of cultivation or production, the quality and the commercial value of numerous products were examined and reported on, including cereals and other food stuffs, essential oils, tobacco, fibre, tanning materials, gums and resins, rubber, vegetable oils and fats, drugs. A large number of investigations related to the composition and value of newly discovered minerals and have been the means of initiating commercial enterprise in several countries. The Department has also been intimately concerned in the development of the rubber industry in several of the Colonies and with the extended production and utilisation of vegetable oils. Large numbers of enquiries on these and similar subjects

are each year received from manufacturers and merchants in the United Kingdom. A large collection of reference samples of important products is maintained by this Department, as to which full information may be supplied with a view to their commercial utilisation. Detailed information respecting the operations of this Department is supplied to Parliament in an "Annual Report." Special reports are also issued as Supplementary Publications on important classes of products which have been the subject of investigation in the Department such as "Rubber" and "Odorous Substances", "Gums and Resins", "Fibres", etc.

A considerable amount of original research on subjects connected with tropical agriculture is also carried on in the laboratories of the Department. In a series of researches the results of which have been communicated to the Royal Society of London, it has been shown that occasional poisonous properties exhibited by certain tropical foodstuffs, such as Lotus of Egypt, Sorghum, Cassava and Phaseolus are due to the presence within the plants of glucosides which give rise to the formation of prussic acid, and the occurrence of which in certain cases may be modified by cultivation. For this subject the name proposed "cyanogenesis" has been generally adopted and similar observations on the occurrence of "cyanogenetic" glucosides in other plants have been made by other workers.

The cause of the Molteno or Pictou disease in horses, which is well known in South Africa and Canada, has been traced through investigations in the Department to an alkaloid which occurs in a species of groundsel (*Senecio*) eaten by the animals.

The alkaloids in some of the most important of the Indian aconites have been isolated and characterised and shown to be of medicinal value. Early the active constituents of a number of drugs have been ascertained and the chemical constitution of numerous new essential oils has been determined. Among new materials the constituents of which have been ascertained in the Department and which have been introduced to commerce may be mentioned: the oil of the Para Rubber seed as a substitute for linseed oil, the wax of a South African myrtle for the manufacture of polishes for wood and leather, the pods of an Indian *Caesalpinia* as a valuable tanning agent.

Among the more important investigations carried on in conjunction with the Agricultural Departments in the tropics may be mentioned the extensive enquiry which is in progress in conjunction with the Agricultural Department of Ceylon in order to determine the precise variations in the composition of rubber latex dependent on variations in age and mode of tapping and on the value of various methods of coagulating and preparing rubber in the form best adapted for commercial use.

The Scientific and Technical Department has become a central establishment for the conducting of enquiries and researches auxiliary to all branches of tropical agriculture; specially trained members of its staff, chemists, and mineralogists, have been appointed to the technical departments in a number of the British Dominions.

The "Bulletin of the Imperial Institute" is published quarterly serves not only as a means of disseminating information respecting enquiries and investigations conducted at the Institute, but also of giving a progress report on the development of agriculture and of industries throughout the world, more especially with reference to utilisation of the raw materials of the tropics. It also includes special articles by authorities in different parts of the world. Among these may be mentioned, "The Cotton Worm in Egypt" by G. C. Dudgeon, Director General of Agriculture in Egypt, "Agricultural Progress in Uganda" by P. H. Lamb, lately Chief Agricultural Officer in Uganda, "Agricultural Progress in the German Colonies" by Dr. Busse of the German Colonial Office. In order to provide information respecting the cultivation and production of the chief agricultural products of the Colonies the "Imperial Institute Series of Handbooks to the Commercial Regions of the Tropics" is being published. The volumes at present issued relate to the "Agricultural and Forest Products of British West Africa", "Cocoa" and "Rubber". Other volumes are in preparation.

The Imperial Institute is the headquarters of several societies which are conducting work of general Imperial utility, including the Tropical Diseases Bureau and the British Section of the International Association for Tropical Agriculture, a branch of the Association which has its Central Bureau in Paris. In June 1914 an International Congress of Tropical Agriculture under the auspices of this Association will be held in London at the Imperial Institute, and in connection with it two important International Exhibitions will also be held, one relating to Rubber and the other to Cotton and Fibres.

On the Organization of the Meteorological Service in Hungary

by

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I. — HISTORY OF THE SERVICE.

In the sitting of April 6, 1868, the Hungarian Academy of Sciences approved the scheme, later presented to the Ministry of Public Instruction which concerned the systematic organization of the meteorological observations to be made in the country and the creation of an independent institute for the purpose. Consequently upon this initiative, and with approval of the King, given in Vienna on April 8, 1870, the creation of the institute was decided, and its first director was nominated on July 1 of the same year.

the beginning the Institute was purely scientific and its activity was restricted to research on the meteorology and terrestrial magnetism of the country. For a long while, about twenty years, its sphere of action was restricted, its staff being small (only the director and two employees), its funds at its disposal were besides quite inadequate (the budget in 1871 amounted to \$617). The Institute did not possess an observatory in the strict sense of the word, and in 1871 had at its disposal only 47 stations. Under these conditions the Institute had to limit itself to working up and publishing significant observations. With time, however, work of practical importance came to be added to the exclusively scientific service, thus increasing the scope of the Institute; this included the organization of a network of pluviometric stations, established with the object of regular observation of the watercourses and giving warnings of approaching inundations, and the organization of the weather forecast service. These new branches of activity brought the Institute into closer touch with the Ministry of Agriculture, which at first granted a subsidy under the form of assistance for upkeep. In 1893 the Institute passed from the jurisdiction of the Ministry of Instruction to that of Agriculture. From that moment the activity of the Institute began to extend. The means increased and the staff also. Consequent upon this administrative change, the Institute underwent in 1896 a new organization, under which its service was divided into sections according to the work done. In 1900, a new building was erected at Ogyalla for the Central Observatory of Meteorology and Terrestrial Magnetism, and finally in 1910 the Institute was transferred to Budapest in its own building, where the seat of the Central Office and one of the first-class stations are situated.

II. — PRESENT ORGANIZATION.

The Institute is divided at present into 6 sections, namely: 1) climatological, 2) pluviometric, 3) forecasting, 4) aerological, 5) observatory, and 6) administrative section. At the head of each section there is a chief, appointed by the Director, who distributes the work of the section among the various employees.

Climatological section. — This section is the centre of the Institute; its duty is the collection of exact data on the meteorological conditions of the country, and of determining its climate. The available network of meteorological observation consists of 180 stations, of which 10 are of the first class, 80 of the second, and 90 of the third. The latter are devoted exclusively to the systematic collection of thermo-dynamic data. The stations of the second class, besides instruments for determining temperature and rainfall, are provided also with the necessary apparatus for observations of other meteorological factors. They register daily: barometric pressure, moisture of the air, direction and force of wind, and the shape of the clouds. They generally possess a barometer, a maximum and minimum thermometers, a psychrometer (August type), and sometimes hygrometer and wind-vane (Wild type); some of them are

also provided with heliographs (Campbell-Stokes type) and with thermometers for measuring the temperature of the soil. The stations of the first class differ from those of the second in that they use also self-registering apparatus.

The climatological section works up the observations written on special forms which it receives every month, it checks their correctness and publishes them in the first part of the *Meteorological Annual*. In the first part the daily readings of 14 stations are published *in extenso* on the international model, whilst for the other stations only monthly and yearly summaries are published. This section also collects for the Central Statistical Office the monthly observations of 14 stations which appear regularly in the *Monthly Statistical Publications*. It publishes besides, in its monthly bulletin, the meteorological conditions of the preceding month and the average monthly readings of 30 stations and their deviation from the normal average. This monthly bulletin, accompanied by a map showing the distribution of rainfall, is designed especially for abroad.

Daily observations are made in all the stations at 7 a. m., 2 p. m. and 9 p. m. The diagrams of the registering apparatus of the stations of the first class are worked up by a subdivision (registering section) of the climatological section. The data afforded by the registering instruments are published in the second part of the *Meteorological Annual*.

Two other small groups of observatories belong to the climatological section. They are devoted to special objects, namely vine-growing and forestry. The Institute does not control them except from the meteorological point of view and, according to an agreement, works up the data and forwards them to the Central Ampelographical Institute at Budapest or to the Central Forest Experiment Station at Selmeczbánya: these institutions utilize these data from the point of view of growth of vegetation and of phytopathology. Eleven second-class stations, all of them situated in vineyards, belong to the vine-growing group of observatories; they possess, besides the usual instruments, heliographs and thermometers for measuring the temperature of the soil. The forest group includes eight double stations, of which one works under the trees and the other in clearings.

For more precise and detailed researches on the meteorological conditions of the largest plain of Hungary (Alföld), nine stations have been working at the commencement of 1913, all of them being situated in the open country. The thermometers are placed in shelters (English type) in identical conditions. It is hoped that these stations established in the plain at equal distances and protected against disturbing influences will furnish data which may be used as a basis even for the theoretical study of climatology.

2. Rainfall Section. — This section is especially devoted to hydrographical purposes. The number of these stations is 1200, each of which is provided with two raingauges; 14 stations possess also pluviographs. For the distribution of these stations special attention is given to mountainous regions. In a monthly report the section forwards to the Institute the data

the daily quantities of rainfall measured. During the winter the depth of snow is also measured. The Institute publishes all these data in the form of its *Meteorological Annual*, partly *in extenso* and partly under the form of monthly and yearly totals. The *Annual* contains, as an appendix, maps showing in detail the distribution of rainfall over the whole country based on the monthly and yearly data. Among the rainfall stations there are 100 for giving warning of approaching inundations which telegraph the data of rainfall to the Hydrographic Section. This in its works up these data for its daily reports on the water-level of rivers and streams. During the winter months remarks on the conditions of the ice are added to the telegram, and for this object the stations are provided with thermometers. On the other hand, during the winter all the pluviometric stations send postcards containing information on the snow conditions every ten days direct to the Hydrographical Station. Up to the end of 1912 there was a special storm service in the Institute. The results of its observations were published in the 3rd part of the *Annual*. At the beginning of 1913 this service, previously undertaken by volunteer collaborators, was handed over to the pluviometric section.

3. *Forecasting section.*—This section draws up the telegram concerning the state of atmospheric conditions and the forecasts as to the same. It issues two bulletins every day: 1) on the atmospheric conditions of Hungary; 2) on those of the whole of Europe.

The publication of a National Meteorological Bulletin satisfies a want long felt, for during the growing season the centres interested and the general public wish to have, as soon as possible, reliable information on the meteorological conditions of the country, especially concerning the rainfall, which has so great an influence on the crops. Thus the daily rainfall of at least 150 localities is to be found in the National Meteorological Bulletin. As already been stated, 100 pluviometric stations telegraph data on rainfall to the Hydrographical Section, which forwards them by telephone to the Institute. There are besides about fifty other stations which send telegrams concerning other meteorological factors, namely: 23 stations send readings taken at 9 p. m. and at 7 a. m. on the atmospheric pressure, temperature, wind and clouds, besides the observations made during the preceding 24 hours on rainfall and maximum and minimum temperatures; 10 stations telegraph all the above data with the exception of those concerning atmospheric pressure. The data are used as a basis for the National Meteorological Bulletin, in which the figures are collected in Tables, and diagrams show curves of equal rainfall and of equal temperatures, while the text summarizes the weather conditions of the previous day.

The European Meteorological Bulletin contains the weather reports received in the evening and of the morning from 14 Hungarian stations, 9 Austrian, 9 German, 9 French and Swiss, 6 English, 5 Scandinavian, 20 Russian, 10 from the Balkan peninsula and 9 Italian, which are sent according to the international form of meteorological telegrams. This Bulletin is illustrated by two maps: one is a synopsis showing the state of the weather in the morning, and the other is a small map showing the isobars of the pre-

ceding evening. The text gives a condensed description of the meteorological events of the preceding day in the whole of Europe and publishes the forecasts for the next 24 hours.

The forecasting service itself deals with the international telegraph service. It receives in its own telegraph office the telegrams from abroad (for the most part collective telegrams arrive from Vienna, Hamburg, Rome and St. Petersburg), and sends out to the foreign central stations data from Hungarian stations; it also forwards European information to Belgrade, Sofia and Bucharest.

The two Bulletins appear during the first hours of the afternoon in the capital they are immediately handed over to the newspapers, to the municipal authorities and to private subscribers; to the provinces they are posted. As neither the Bulletins nor the newspapers can publish the weather forecasts rapidly enough these have, since 1891, been circulated throughout the country by telegram. The section draws up at noon the telegram of forecasts; a copy is sent to the Central Telegraph Office, which forwards it all over the country, together with the circular telegram containing the Budapest official Stock Exchange and market news.

The text of the forecast telegram consists of a form of 34 phrases containing all that is required for stating weather conditions. The telegraph offices that have the duty of hanging up the weather forecasts for public inspection are supplied with special frames on which small plates may be hung. These plates bear permanent inscriptions corresponding to the text of the forecast. Each frame can carry 12 plates for the names of the months, 31 for the days of the month and 34 for the text of the forecast. At present about 400 telegraph offices keep these forecasts exposed to the public.

On the strength of the information received by telegram the forecasting section draws up a weather report every two weeks and sends it to the agricultural section of the Ministry of Agriculture. This report shows on a chart the distribution of the rainfall (and the areas damaged by hail) and completes the report on the state of the crops.

4. *Aerological section.* — With the exception of some stations at an elevated altitude, the Institute has not done much in this direction. It is only since the beginning of 1913 that it has included in its programme the study of the upper strata of the atmosphere, limiting itself to: 1) sending up daily a pilot balloon and following its course with theodolites; 2) sending up free unmanned balloons on the same days as other countries send theirs, as per international arrangement. The data thus acquired are sent to the seat of the International Scientific Aerostatic Committee at Strassburg.

5. *Observatory.* — The Central Observatory of the Institute is situated at Ogyalla in the small Hungarian plain (Kis Magyar Alföld). The Observatory building includes the offices and the dwellings of some of the officials. On the tower anemographs are placed, while the meteorological instruments are situated in the garden. Two other observatories are attached to it, one for terrestrial magnetism and the other for seismological observations at

the study of the electricity of the atmosphere. The data furnished by the observatory are published in the second part of the *Meteorological Annual*, which contains the hourly readings of all the weather registering stations, the data of terrestrial magnetism and those of the potential of electricity of the atmosphere.

1. Presidents' section. — This deals with administrative affairs, such as questions relating to the budget, part of the correspondence, inventories and the like.

The Institute possesses a well-equipped workshop in which the instruments are built and repaired.

The library contains at present 8246 books and 3646 pamphlets, mostly on meteorology and worth nearly £3 000.

The majority of the collaborators of the Institute are unpaid, but they get some bonuses. Thus a pluviometric station is allowed an average of 10 shillings a year, and 50 shillings if it attends also to sending off the rains. A second-class telegraph station gets £3 6s 6d; some stations are of permanency of which is especially desirable, or which have self-registering apparatus, get from £4 3s to £8 6s. The total amount of bonuses paid by the Institute amounts to about £1458.

Regular inspections ensure the orderly and regular service of the instruments.

The principal official publications of the Institute are: 1) the *Meteorological Annual*, published every year in four volumes; 2) the two *Daily Meteorological Bulletins*; 3) the *Scientific Annual* containing, a) a large volume in two languages for the publication of original work, b) a smaller volume published only in Magyar; 4) *Report upon the Year's Work of the Institute* in the Magyar and German languages.

Besides the above, an Official of the Institute publishes with its assistance a Monthly Meteorological Review called *Időjárás* ("The state of the sphere"), now in its eighteenth year. Since its first appearance it has been distributed free of charge to about 350 collaborators.

While chiefly dealing with the knowledge of the meteorological conditions of Hungary, the Institute keeps in touch with kindred institutions abroad. It must also be mentioned that the data on meteorological conditions which the Institute collects at the request of public offices and private persons increase from year to year.

The name of the Institute is *Magyar Királyi országos Meteorologia és Végességi Intézet* (Royal Hungarian Institute of Meteorology and Terrestrial Magnetism). Its seat is at Budapest and it is a dependency of the Ministry of Agriculture. Its yearly budget amounts generally to about £9 700, and its staff is composed of 26 officials.

The Present Status of the Fruit Industry of the Dominion of Canada

by

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INTRODUCTION.

Historical. — Fruit has been cultivated in Canada since the early part of the 17th century when the French settlers in Acadia, now the Province of Nova Scotia, and also the settlers along the banks of the St. Lawrence in the present Province of Quebec, brought with them seeds and trees from France and planted them. It has, however, been only during the past fifty or sixty years that fruit has been grown to any large extent for commercial purposes.

Kinds of fruit grown in Canada. — The kinds of fruit grown in Canada for sale are apples, pears, plums, cherries, peaches, apricots, grapes, currants, gooseberries, raspberries, blackberries, loganberries, strawberries and cranberries. There is also a large sale of blueberries and huckleberries which are picked from plants in the wild state.

Fruit districts of Canada. — There is a very large area in Canada suited to the growing of fruit. Apples are grown to the largest extent in the provinces of Ontario, Nova Scotia, Quebec and British Columbia, but they grow well also in the provinces of New Brunswick and Prince Edward Island. The largest number of bearing apple trees is in the Province of Ontario where in 1910 there were 6 544 788 trees and 2 053 302 more trees yet bearing. In the prairie provinces of Manitoba, Saskatchewan and Alberta tree fruits are not grown except to a limited extent in the most favourable locations, where some apples, crab apples and plums are produced.

The commercial culture of the pear is confined mainly to the provinces of Ontario and British Columbia, though pears succeed well in Nova Scotia and the hardiest varieties can be grown in Quebec, New Brunswick and Prince Edward Island.

The most favourable climatic conditions for plums are found in Ontario, Nova Scotia and British Columbia, but certain varieties of the Domestic plum can be grown in Prince Edward Island, New Brunswick and Quebec. The native plums *Prunus nigra* and *P. americana* are grown successfully in the colder parts of Canada, and the early varieties succeed in the prairie provinces.

Ontario produces the largest quantity of cherries and they have been planted to a considerable extent in British Columbia, but they are grown successfully also in Nova Scotia and Prince Edward Island and to a limited extent in favoured parts of the Province of Quebec.

Peaches are grown commercially in the south-western part of the province of Ontario and in British Columbia but they can be successfully grown also in the warmer parts of Nova Scotia.

The commercial culture of grapes is confined to southern Ontario, but they can be ripened also in all the other provinces of Canada with the exception of the prairies, where only the very earliest can be got to ripen when grown in the most favourable locations and produced in winter.

Blackberries are grown mainly in Ontario and British Columbia and the culture of loganberries is confined to the warmer parts of British Columbia; but currants, gooseberries, raspberries and strawberries are grown in all the provinces.

Value of fruit exported from Canada 1912-13. — A large proportion of the fruit grown in Canada is consumed there, but the following figures show the quantity and value of that which was exported during the fiscal year beginning April 1st, 1912, and ending March 31st, 1913:

	Value — \$
Fruits, dried (3 199 539 lbs)	214 442
Apples, green or ripe (1 374 769 barrels)	4 047 806
Berries of all kinds	100 019
Canned and preserved fruits	220 786
Other fruits	96 741
Total fruits exported	4 679 794

VARIETIES AND BREEDING.

Fruits of Canadian origin. — While it is expected that before long a much larger proportion of fruits grown commercially in Canada will be of Canadian origin, at present only a small proportion are such. Some of the best known fruits originated in Canada are:

Apples: Fameuse, McIntosh Red, St. Lawrence, Ontario, New Brunswick, Canada Baldwin, Banks Gravenstein, Swayzie Pomme Grise, etc., Trenton, Crimson Beauty.

Peaches: Fitzgerald, Banner, Tyehurst.

Pears: Dempsey, Ritson.

Plums: Glass Seedling, Mount Royal, Raynes.

Cherries: Windsor.

Grapes: Brant, Canada, Moyer, Burnet, Kensington, Jessica.

Raspberries: Herbert, Hilborn, Smith Giant.

Black currants: Saunders, Beauty, Kerry, Magnus, Clipper, Climax, etc.

Gooseberries: Pearl, Josselyn (Red Jacket).

Strawberries: Williams.

Fruit breeding. — Fruit breeding was begun in Canada between twenty-five and fifty years ago by private persons and several of

the varieties mentioned above were the result of hand pollination. During recent years the Federal and Provincial Governments have rendered assistance, and fruit breeding is now an important part of the work at the Central Experimental Farm, Ottawa, Ontario, the Horticultural Experiment Station, Jordan Harbor, Ont., and the Ontario Agricultural College, Guelph, Ont. It is at Ottawa, however, that most of the work has so far been done. Cross breeding was begun there in 1894 and over 2000 apple trees have been grown as the result of this work during the past 19 years. A large number of these have fruited and have been propagated and distributed free for test. Since 1890 between 5000 and 6000 apple trees have been raised from seed where only one parent was known. There have been promising seedlings in this lot and have been named. Some 24 000 seedlings of the hardiest apples are being grown at the Federal Stations in the prairie provinces in order to eliminate the tender trees by exposing them to the severe winters, and it is proposed to try much larger numbers. Other fruits which have been used in breeding work are plums, grapes, currants, gooseberries, raspberries and strawberries. The objects in breeding are to obtain hardier good varieties, to extend the cultivation of fruits into colder districts, and to obtain better varieties for the principal fruit districts. Owing to the long distance which is necessary to ship fruit in Canada, varieties having good shipping properties are sought for.

During the last fifteen years records have been kept of the yields of individual apple trees at the Central Experimental Farm, Ottawa, and it has been found that some trees of any one variety planted at the same time and under very similar conditions yield much more than others. Trees have been propagated from heavy and light bearing trees to learn if this habit continues when the trees are grafted. These trees are now beginning to bear and some definitive information is looked for soon.

CULTIVATION AND MARKETING.

Methods of culture. — In a country as large as Canada the methods of culture vary somewhat. In the great fruit districts of Ontario and Nova Scotia the practice is to cultivate the orchards until about the middle of July and then to sow seed for a cover crop, such as red or crimson clover, vetch or rape, which will be ploughed in early the following spring. Where the climate is colder it has been found good practice to merely plough the orchard in the spring, harrow it a few times to get the weeds under control, and then sow seed for a clover crop in the month of June. This system is desirable where there is danger of the trees growing too late and being injured by winter. In the province of Quebec many growers prefer to leave their orchards in sod to ensure thorough ripening of the wood before winter. In parts of British Columbia irrigation is practised.

Most of the grapes are grown in the Province of Ontario. They are usually planted 10 X 10 feet apart and are tied to a trellis of two or three wires. In many places in Canada where the winter is cold but

ers very warm, grapes are grown for home use by covering the vines soil during the winter. Except in British Columbia, strawberries are grown to any extent in the hill system or as single plants as they are in Great Britain and Europe, but in matted rows, the plants being six or less apart. By this method the plants protect each other and are not so subject to heaving when the ground freezes, nor is the fruit exposed so much to the sun.

Spraying. — Spraying is practised by a large proportion of the fruit growers in Canada. The principal insecticide used for biting insects was Paris green until quite recently, but arsenate of lead is fast taking its place. For scale the lime-sulphur wash is used when the trees are dormant. Lime-sulphur is now generally used for spraying to control certain diseases, such as apple scab and peach leaf curl, when the trees are dormant, and to some extent during the growing season, although Bordeaux mixture is commonly used as a summer spray. There is no good means for controlling aphids on tree fruits, although tobacco extracts, soaps and kerosene emulsion are all effective.

Transportation facilities. — The distances to which fruit has to be transported in Canada are in some cases very great, both for the home market and to reach the ports in order that it may be sent abroad, but within two years there will be three trans-continental railways from the Atlantic to the Pacific oceans, and these, with the many branch lines already in operation, afford excellent means of distributing the fruit. Refrigerator cars furnished by the railway companies when needed.

Markets. — The home market for Canadian fruits is growing rapidly. There are now about 8 000 000 people in Canada who consume a very large quantity of fruit. In the Prairie provinces where tree fruits do not succeed and where the main crop is cereals, it is estimated that there are 100 square miles suitable for cultivation. This area is being rapidly settled and offers a splendid home market for fruit from the other provinces of Canada. Great Britain and European countries take large quantities of Canadian fruit, as has been shown above.

Co-operation. — The spirit of co-operation in the fruit growing industry is increasing rapidly in Canada, and much has been accomplished in this direction already to assist the fruit grower in getting better prices for his product.

In the province of Ontario there are 52 co-operative fruit growers' associations; in Nova Scotia, 32; in Quebec, 8; and in British Columbia, 10. In Nova Scotia, Ontario and British Columbia most of the associations have been organized to form central selling agencies in order that they may control the sale of their fruit. These are known as the United Fruit Growers Limited, Berwick, N. S.; The Ontario Fruit Growers Limited, Toronto; The Okanagan United Growers Limited, Vernon, B. C.

Many of the local co-operative associations are incorporated companies. They buy supplies as well as sell the fruit. In the best organized associations there is a manager who is paid a percentage on the amount of product handled. There is a central packing house so that the fruit may be properly graded. In some cases the returns are pooled and the growers

are paid according to the proportion of the different grades of fruit furnished by the producers. In other cases the association ships but does not pack co-operatively and each man's fruit sells on its merits. The officers of a local association usually consist of the president, vice-president, secretary-treasurer, and five directors. There is also a manager on salary, or paid on commission, who supervises the grading and packing, shipping of the fruit and other matters relating to the association.

Legislation. — The Canadian Constitution gives the Federal Government control of certain kinds of agricultural legislation which is interprovincial and effective throughout the whole of Canada. In relation to the fruit industry, for instance, the size of packages in which fruit may be marketed is controlled by the Dominion Government. There are also standards fixed by the Government for the different grades of fruit marketed. The marking on the packages is also regulated by the Government.

Legal barrels, boxes, and baskets in Canada. — The minimum size of the apple barrel in Canada is ninety-six quarts. When apples are packed in boxes for export for sale the inside dimensions of the box must not be less than ten inches deep, eleven inches in width, and twenty inches in length. When apples are packed in boxes or barrels having trays or layers wherein it is intended to have a separate compartment for each apple the size of box need not be as above. Boxes for small fruits are two-fifths of a quart and four-fifths of a quart. Legal baskets must hold two and two-fifths quarts, six quarts, eleven quarts and fifteen quarts respectively.

Packing and marking fruit. — The name and address of the packer must be stamped on every closed package of fruit. The name of the variety or varieties must be stamped on every closed package of fruit. There must also be a mark indicating the grade of fruit.

Legal grades of apples. — There are four legal grades of apples offered for sale in Canada or exported, namely: Fancy, No. 1, No. 2, and No. 3.

Fancy fruit consists of well-grown specimens of one variety, sound, of uniform and of at least normal size and of good colour for the variety, of normal shape, free from worm holes, bruises, scab and other defects, and properly packed. No. 1 quality is fruit which has no culls and consists of well-grown specimens of one variety, sound, of not less than medium size and of good colour for the variety, of normal shape and not less than nine per cent. free from scab, worm holes, bruises and other defects, and properly packed. No. 2 quality is fruit which has no culls and consists of specimens of not less than nearly medium size for the variety, and not less than eight per cent. free from worm holes and such other defects as cause material waste, and properly packed.

The faced or shown surface gives, by law, a false representation of the contents of the package: if more than fifteen per cent. of such fruit is substantially smaller in size than, or inferior in grade to, or different in variety from, the faced or shown surface of such packing.

In regard to fruit imported into Canada: "The Governor in Council by regulation may prescribe the kinds of imported fruit, the packages containing which must be branded or marked", prescribe the brands or marks

used thereon; prescribe the manner and places in and at which such is to be inspected and such packages branded or marked. In order that the above regulations shall be complied with, Inspectors employed who inspect the fruit at the packing houses, on the market at the chief shipping points, and at other places. It is the Inspector's duty to mark any package containing fruit "Falsely Marked", "Falsely Packed", if it does not comply with the regulations. There are also fines for improper packing and marking.

GOVERNMENT AID TO FRUIT GROWERS.

Colleges. — There are four Agricultural Colleges at which a four years' course in agriculture is given and from which, or through the Universities to which they are affiliated, the graduates receive the degree of Bachelor of Science of Agriculture (B. S. A.). These colleges are the Ontario Agricultural College, Guelph, Ont.; the Macdonald College, Macdonald College, Que.; the Trappist College, La Trappe, Que.; and the Manitoba Agricultural College, Winnipeg, Man. At these colleges the students receive a special course in horticulture. There is also the Maritime Agricultural College, Miramichi, N. S., at which the students are given a two years' course in agriculture and horticulture, and an Agricultural School at Ste. Anne de Pocatiere, Que. In connection with the Agricultural Colleges, short courses in horticulture lasting from one to two weeks are given. These colleges are supported mainly by the provincial governments and by private donors, but the Federal Government also gives some assistance.

Experimental Farms. — There are sixteen Experimental Farms or Stations in Canada supported by the Federal Government, of which the Central Farm is at Ottawa, Ont. The appropriation for the maintenance of these and other farms is this year \$870,000, exclusive of salaries of the permanent staff.

At the Experimental Stations experiments in methods of culture, tests of varieties, spraying and plant breeding are carried on in order to aid fruit growers in the different provinces. The divisions of Chemistry, Entomology and Botany, with headquarters at the Central Farm at Ottawa, lend their aid in the more scientific aspects of horticulture. The farms are bureaus of information to which fruit growers may write and receive replies without any cost to themselves. Annual reports and bulletins are published giving an account of the work done. There are also experimental farms associated with the provincial agricultural colleges.

District or County Instructors. — In the provinces of Ontario, Quebec and British Columbia the provincial governments have instructors or district representatives whose duty it is to go through the country and give information and instruction to farmers and fruit growers and in some cases to carry on demonstrations of the best methods of orchard practice. They have their headquarters, where people may come to get information or where they may write for it. In the province of Ontario there are now 31 representatives and an almost equal number of assistants.

Demonstration Orchards. — In the provinces of Nova Scotia, New Brunswick, Prince Edward Island and British Columbia there are small orchards of from one to five acres to demonstrate the best varieties and methods of culture. There are, for instance, 35 of these in Nova Scotia and 23 in New Brunswick. The provincial government furnishes the trees free and sends a man to plant them, the owner caring for the trees according to directions for ten years or more. The Government also sometimes supplies a sprayer pump.

Exhibitions. — The Governments, both Federal and Provincial, aid the fruit grower by assisting in making exhibits of fruits both in Canada and in other countries, in order to advertise the good quality of Canadian fruit and thus help to find markets for it. Rules for judging fruits have been adopted by several of the provincial fruit-growers' associations.

Packing Demonstrations. — Both the Federal and Provincial Governments aid the fruit grower by giving demonstrations by expert packers in packing fruit. Last winter, for instance, 40 such demonstrations or schools were conducted in the province of British Columbia alone.

Cold Storage and Markets. — The General Government aids the fruit grower by helping him to get his products to market in good condition. For the shipment of fruit in refrigerator car loads intended for export, the Government pays icing charges to the extent of \$ 5.00 per car. Arrangements are also made by the Government to have small cold-storage chambers on steamships reserved for the carriage of fruit only. This has resulted in a large increase in the amount of tender fruit exported. Temperature records are kept by the Government on the steamers carrying fruit in order to ensure its being well looked after, and inspectors are employed by the Government to inspect the cargoes both on steamers and in refrigerator cars.

Subsidies are also given by the Government to aid in the erection of cold-storage plants throughout Canada. And also in the precooling of fruits before shipment.

Protection against diseases and injurious insects. — There is an Act of Parliament known as the "Destructive Insect and Pest Act" which empowers the Government to inspect fruit trees coming from other countries into Canada, and to fumigate them at stations controlled by the Federal Government. The Provincial Governments also have laws within the provinces giving them power to inspect trees in nurseries and to enforce fumigation before shipment from the nurseries. Inspectors of the Entomological Division and Botanical Division of the Department of Agriculture, and men employed by the Provincial Government, spend much time in the orchards seeking information in regard to any injurious insects and diseases and finding methods of controlling them.

Fruit-Growers' Associations. — There are seven provincial fruit-growers' associations in Canada in the provinces of Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia. These associations are supported in part by the Provincial Governments. Subjects relating to the fruit industry are discussed

their annual meetings, which last about two days. They are powerful in bringing about needed legislation in regard to the fruit industry. From time to time representatives of these associations meet at Ottawa in a Dominion Conference in which matters affecting legislation for the whole of Canada are discussed.

Fruit Crop Report. — A monthly report on the condition of the fruit in Canada and in other countries is published by the Federal Government during the growing season. Newspaper reports are also issued from time to time. The information for these reports is gathered from a large number of fruit growers throughout Canada. The Provincial Governments issue reports.

Bulletins and Periodicals. — In addition to the report and bulletins which are published by the Dominion and Provincial Governments, and which are furnished free to anyone who asks for them, there are several horticultural periodicals published by private companies in Canada which take up considerable space to fruit culture.

Canning Factories — Much fruit is canned in Canada and new factories are starting from time to time, and there is every prospect that this phase of the fruit industry will develop very much.

In conclusion we beg to state that the outlook for fruit growing in Canada is good. The areas where fruit can be successfully grown are, especially in the case of the apple particularly, so great that if a large proportion were utilized Canada could supply the world for a long time to come. What is needed is good organization and good distribution all over Canada in order to avoid gluts and these conditions give greater promise of fulfilment every year.

Elements for the Valuation of Fruit Trees

by

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It is only quite recently that fruit trees have begun to be considered as revenue-bearing capital, the value of which can be ascertained only by knowing the value, expressed in money, of the crops yielded by them from year to year or in longer periods. The methods hitherto adopted for the estimation of the value of fruit trees were based on very vague estimations which in cases of the sale of orchards or of individual trees led mostly to very low figures or in other words to the disadvantage of the vendor. In order to introduce the above criterion into practice, it became necessary to procure that basis which rendered it possible to get, in figures, the complex factors involved; it consisted in the main in determining the reliable average figures concerning the greatest age of the fruit trees,

the commencement of their bearing, and the yields in fruit or in wood which the trees can give in the whole course of their life. The few data to be found in the literature bearing on this subject were not satisfactory owing to their being partly improbable. It was thus advisable to take steps to get reliable figures which would also be of use in revising existing observations. In collaboration with the "Austrian Fruit-growers' Association" of Vienna, I have undertaken the not easy task of examining and arranging the figures obtained from prominent and trustworthy fruit growers, living at a distance from each other. I cannot enter here into details of this work which I have treated exhaustively in the "Verhandlungen der zweiten Tagung der Oesterreichischen Obstbau- und Pomologie-Gesellschaft", Vienna 1911. I shall give instead the chief results of my research, together with a brief discussion of the same. In the same report there is another paper of mine under the title "A valuation of fruit trees based on new considerations", which I mention because the two papers are connected and complete each other.

The following summary is based on 41 trustworthy reports made from different countries, and gives information, referred to standards, bush standards, bush trees and other forms, on those three main questions which have been considered the foundation of the valuation of fruit trees. For sake of comparison, the accompanying table (p. 1821) includes those figures mainly taken from the works of Prof. Christ and E. Junge (*Anleitung zur Wert- und Rentabilitätsberechnung von Obstkulturen*. Berlin, 1905. P. Part which have hitherto been accepted as reliable.

The table gives, for bush trees and other forms not standards or bush standards, a series of indications regarding beginning of bearing, high age, and total yield which were previously not available.

With standards and half-standards it appears that, except for walnuts, there is not much difference between the new and the old data respecting the age at which the trees begin to bear. On the contrary, with but few exceptions, the average figures for greatest age and total yield hitherto accepted are shown to be too low. The exceptions are in the greatest age of the pear and the total yield of the plum.

I am quite aware that, especially in questions relating to yield, the figures should not be used, but sometimes it is necessary to use some use average figures and particularly in the valuation of fruit trees it is impossible to do without them. Of course the averages adopted must be recognized by expert circles. This is the case here, for the members of the Austrian Fruit-growers' Association have unanimously decided to consider for the present the average figures given in the table as trustworthy.

A very important premise for a possibly exact valuation of fruit trees is the correct knowledge of their age. Usually this is not known, and the valuations to which recourse had to be had until recently gave very doubtful results, as was often subsequently proved by felling the trees.

By considering the average annual increase of the circumference of the stem, measured at a height of 3 ft. 3 in. from the ground, a means has been now found of avoiding gross errors in the estimation of the age of standards.

Summary of General Averages, compared with the data hitherto accepted.

I of fruit	Bush trees and other forms						Standards and half-standards					
	Commence- ment of bearing		Highest age		Total yield of fruit during life of tree		Commence- ment of bearing		Highest age		Total yield of fruit during life of tree	
	Average						Average					
	Hitherto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry
					lbs.	lbs.					lbs.	lbs.
Apple	4	4	33	30	678	1100	10	8	60	70	3630	5200
Cherry	4	4	33	30	1150	1080	8	8	80	80	5400	7220
Peach	—	5	—	30	—	690	—	6	—	35	—	770
Barberry	—	4	—	40	—	385	—	5	—	40	—	715
Blackberry	—	5	—	30	—	850 10 1050	5	5	30	35 to 40	1320 to 1760	1550
Strawberry	—	5	—	30	—	800	6	6	40	60	2062	2280
Blackberry	—	4	—	25	—	600	5	5	30	40	1350	2350
Cherry	3	4	12	15	175	300	—	4	—	15	—	350
Blackberry	—	3	—	20	—	550	4	4	20	25	690	895
Blackberry	—	—	—	—	—	—	20	12	100	105	3630	4420
Blackberry	—	5	—	35	—	155	—	—	—	—	—	—
Blackberry	—	—	—	—	—	—	—	12	—	120	—	6630
Blackberry	3	3	16	20	110	200	—	3	—	10	—	100
Blackberry	3	3	16	15	82	190	—	3	—	15	—	100

half-standards. Prof. Steglich has done much work in this connection and also for many years have been occupied with the subject.

Under normal conditions of vegetation the average annual increase of circumference of the stem is :

	cm.	in.
Apple and Apricot	2.0	0.8
Walnut	2.5	1.0
Pear and Plum	3.0	1.2
Cherry and Morello	4.0	1.6

Thus, for instance, a cherry tree measuring 40 cm. (15.7 in.) in circumference at a height of 3 ft. 3 in. would be ten years old, while an apple tree of the same girth would be 20 years old. If the conditions of growth, such as soil, position and climate, be duly taken into account, experience has shown that the error is reduced within such limits as not to have much effect upon the valuation of the trees under discussion.

The above-mentioned basis allows us to work out a useful valuation of trees. This calculation, which is based upon the special considerations of my colleague Herr. I. Gürther, is however complicated and requires much preparatory knowledge. I have therefore suggested to my above named collaborator and my former assistant Herr Th. Horn to draw up some tables, at least for standards and half-standards of the most important fruit trees, which should allow of the money value of the trees grown under normal conditions being read straight off as soon their age was known or determined. These tables have been inserted in the reports of the transactions of the second meeting of the Austrian Fruit-growers Association held in Vienna in 1911.

The Distribution of Forests in the Natural Regions of Switzerland

by

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Switzerland is divided topographically into three regions: the Jura, the Plain and the Alps. This division is equally in accordance with one geological structure. The regions are also important from the point of view of the forests; thus, if we take the available statistics, we find that the grouping of the wooded land is very different in the three regions mentioned. In the present article I shall limit myself to a brief description of the forest character of each of these natural divisions.

The *Jura* rises in a steep and even slope from the plain to a considerable height, especially in its western part; but it rarely passes the upper limit of the forests. Its wide rolling top, formed of plateaus only cut up by small valleys and coombes, is almost entirely without water, owing to the nature of the rocks. For this reason habitations are few and always occur near springs in the larger valleys; the Jura villages are chiefly industrial, and often of considerable size.

In the Jura, as elsewhere, the altitude determines the occurrence of distinct zones of vegetation; topographical conditions and the nature of the soil modify the distribution of moisture and heat sufficiently to give rise to various stations characterized by well-defined plant formations. According to altitude, three zones are distinguished: the *lower zone* roughly from

to 700 m. (1300 to 2300 ft.), in which cereals and walnuts, and even *oaks*, still thrive; the *middle* or *montane zone* from 700 to 1300 m. (2300 to 4300 ft.), largely occupied by forests, meadows and moors; the *upper* or *sub-alpine zone*, from 1300 m. (4300 ft.) upwards, occupied by the upper limit of forests (which hardly pass 1400 m. = 4650 ft.) and the pastures which cover all the high ridges.

Altitude is a very important factor in the distribution of forests. These occupy the bulk of the zone between 700 and 1300 m.; indeed, of all the plantations for the Jura, forest undoubtedly occupies the largest area and is the leading part in determining the physiognomy. Further, the proportion of waste ground is far and away smaller in this region than in the rest of the country. The result of these circumstances is that the cantons belonging especially to the Jura are among the best wooded in Switzerland: Schaffhausen 42.6 per cent. of its total area and 44.6 per cent. of the productive soil is forest; in Solothurn these figures are 36.7 and 38.2, and in Neuchâtel 30.9 and 36.1.

In general also it is in the Jura that the forests are most extensive and best; dividing up of land is much less advanced than in other parts of Switzerland. The slopes are generally uniformly wooded over long distances, while on the plateaus, which are particularly numerous in the south, recently only blocks of wood remain. The forest map of Switzerland shows almost uninterrupted wooded belt marking the whole extent of the Jura from Geneva to Schaffhausen, for a length of 150 miles, with an average width of 12 miles.

The Swiss *Alps* form a segment of the great arc of Central Europe. The vertical distribution of vegetation the following altitudinal zones are generally distinguished: the *hill region*, 200 to 700 m. (650 to 2300 ft.), which is the true agricultural region; the *montane region*, 700 to 1200 m. (2300 to 4000 ft.), whose characteristic is forests of broad-leaved and coniferous trees mixed; the *alpine region* 1200 to 2600 m. (4000 to 8600 ft.), the lower part contains conifer forests and pastures, while the upper part is nearly pasture, though sometimes with some trees on it; the *region of eternal snow* comprising the heights above 2600 m.

The proportion of forest is generally less in the Alpine cantons than in the Jura. Contrary to what one might at first sight suppose, agriculture has taken a hold there and maintained itself better; this is due on the one hand to the wide protecting forest belt, and on the other to the configuration of the land and the nature of the soil.

The crystalline rocks decompose readily; they generally give a deep soil which holds moisture and is fertile; they contribute to rounding off and softening of the surface of the land. Further, this land is rarely lacking in water, for the rocks make good beds for throwing out the rain and snow, soaking down from above. Colonization has thus been possible almost everywhere in the Alps: from the chief villages in the valleys, hamlets have split off here and there at different heights where there are springs;

higher up there are the "mayens" and "mazots" (1) on the lower mountains; further up still, isolated chalets occur on the alpine pastures.

Man has thus established himself to some extent wherever favourable conditions were found: the forest has had to give way to him; it has been heavily cleared to a great height to make way for the crops of the mountaineer. The present-day forests are mostly only more or less extensive remnants of those which covered these regions before the advent of man. Fire and axe have further increased the space required by the mountaineer, and his goats and sheep have completed the work. Forest was often cleared even from places where its presence was really essential.

Besides this, a considerable extent of land is unproductive owing to its position. Indeed the forest has had to struggle not only against the repeated attacks of man, but against the ravages of avalanches, rock-falls and torrents. For all these reasons, the proportion of land under forests in the Alps is often very low, a fact which is very often due to the natural causes of a climatic or edaphic nature; the forests are restricted to the soils less suitable to agriculture from lack of fertility or from position. Thus the best wooded canton, Lower Unterwald, has only 23.9 per cent. of its total area and 31.9 per cent. of its productive area under forest; in Valais these figures fall to 14.7 and 26.7.

The dividing up of the forests has also been influenced by these factors. The chief woods extend along the sides of the valleys, forming a wider narrower belt, varying according to aspect and shape of the ground. On slopes reaching right down to the torrents, and those facing north, may be wooded throughout; in this case the forest reaches from the thalweg right to the limit of tree-growth. On gentle slopes, and particularly on the south-facing slopes, however, forests reappear above a certain height, but on again any less steep parts or shoulders are under cultivation. The upper region of the high mountains is given over to pasture, often with the more or less scanty tree growth of the meadow-woods and wooded pastures. Higher up, only the last outliers of woody growth occur, and they give place to the vast zone of subalpine turf, followed by waste land, rocks and glaciers.

The *Plateau* is the region between the Jura and the Alps; from a climatic point of view it may be considered the most favoured of the three natural regions of Switzerland because it is the least elevated. Its configuration, however, hardly justifies the title of plateau; thus the name of "plateau country" ("Hügelland" and "Mittelland") seems more logical.

It is difficult to get a general idea of the distribution of forests in the intermediate region. The cantons between the Jura and the Alps, the "diluvium" and "molasse," many of them reach up onto the Jura

(1) "Mayens" are the half-way houses occupied by the herdsmen in early summer and autumn, before and after the alpine grazing season; "mazots" are barns or store-houses. (Ed.)

nor else include part of the Alps or Prealps; the political divisions thus do correspond with the natural ones. The situation and distribution of forests can be judged more or less from what has already been said. The region of the "molasse" and the glacial deposits, the ridges between valleys are mostly covered by dense forest masses, while the slopes, especially those facing south, are given over to agriculture, unless their steepness or lack of fertility makes wood preferable. In the Prealps, where the "gelifluk" predominates, and where private woods are often abundant owing to the splitting up of the ancient communal properties, only small patches of wood occur scattered in the fields.

The plateau region is the most thickly populated in Switzerland: in 1880 60 per cent. of the total population of the country lives in this intermediate region, though it only occupies 29 per cent. of the surface; it is five-and-a-half times as thickly populated as the Alps. This fact has a great influence on the distribution of the forests and the percentage area under forest in the different regions. Indeed the very varied utilization of the land that we remark is by no means arbitrary; it is a factor of the topographical and climatic conditions of the country, which the farmer must take account in order to get the best yield from the soil; the plain and plateau regions of Switzerland are those in which woods occupy the least extent of cultivable surface: the canton of Geneva has 11.2 per cent. of its arable land under forests, making 9.1 per cent. of the total area; in the Canton of Vaud these figures are 20 per cent. and 16.1 per cent. Further, subdivision has led to the woods occurring as many small stands. The character of the proprietors has also some importance on the distribution of the woods. Generally the more public forests there are, the larger is the area and the more the arrangement of the individual woods, which then often cover considerable areas which might be profitably put under crops.

Switzerland at present possesses something near $2\frac{1}{2}$ million acres of forest, distributed among the three regions as follows:

Jura	20 per cent.
Plateau	25 "
Mountains	55 "

In other words, more than half the Swiss forests occur in the Alps, a quarter in the Plateau, and a fifth in the Jura. The percentage of wooded area in the three natural regions is approximately 33 in the Jura, 22 in the Plateau and 17 in the Alps.

We may perhaps be able to return on a future occasion to certain conclusions which occur to one when one considers the international importance of forests in the region of the sources of certain great European rivers.

Recent Experience and Progress in Dairying in Germany

by

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During the last decades, dairying in Germany, thanks to the constant extension and improvement of cattle keeping, has developed to such an extent that the yearly production of milk is now worth about £ 150 000 000 in round numbers and is consequently superior in value to the bread stuff which in 1909 amounted to £ 141 000 000. Notwithstanding the extraordinary increase of milk production, it has not been able quite to keep pace with the rapid increase of population, which is in round numbers 900 000 per annum. For whilst in 1871 the German Empire had an excess of dairy products and exported about £ 1 912 000 worth, since 1896 it has been obliged every year to import increasing quantities from abroad in order to meet demands. In 1912 the excess of importation amounted already to £ 9 617 650, or 6.5 per cent. of the home production. It behooves cattle breeders to increase still further the milk yield of the cows, in order to render Germany independent of foreign countries. As for the dairy products imported, it is especially to be mentioned that the introduction of cream during the last decades has attained a most unexpected importance. This is connected with the fact that, while, according to existing tariffs, butter pays a duty of about 10s per cwt., milk and cream are duty free.

The number of cows at present existing in Germany is in round numbers 11 millions. If the average milk yield per cow be taken at 506 gallons (2 300 litres) per annum, the total amount of milk produced every year is about 5 566 million gallons. In the large towns the daily consumption of milk per inhabitant ranges from 0.39 to 0.72 pint per day. In the smaller towns the consumption is greater and in the country it is still more so. On an average 0.79 pint per head per day may be taken, or 36 gallons per annum. With a population of 67 millions in round numbers this amounts to a consumption of 2417 million gallons, which is 43 per cent. of the whole quantity of milk produced. If it be further assumed on the strength of careful calculation that the rearing and fattening of calves absorbs 445 million gallons, or 8 per cent. of the milk produced, it is evident that at present only about 49 per cent. remains for the preparation of butter and cheese.

In milking and in the further handling and working up of the milk it is sought as far as possible to conform to hygienic rules. The stables are arranged with a view to keeping the cows clean and the milk as whole

as possible. While formerly in some stables the dung was allowed to rain under the cattle, now the Dutch system of stabling prevails, in which a gutter for the reception of the droppings runs along the back of the stalls and is cleaned out every day.

In order to judge whether the milk delivered by the cow-sheds has been obtained with due regard to cleanliness, the larger dairies test the milk on each farm daily for cleanliness. The reductase test is also frequently adopted, as it allows an opinion to be formed as to the number and kind of bacteria present in each consignment of milk.

With the object of meeting the just demand that all the milk put on the market be wholesome and above all free from tubercle bacilli, the East Prussian Dutch Herdbook Association adopted in 1900 suitable measures, being the first in the whole world to do so. In the East of Prussia this example was soon followed by cooperative dairies, control and cattle breeding associations, etc., so that in the above province at the present time no more than 82 000 animals above two years of age are submitted to the tuberculin test. The total number of animals (including young animals and calves) in the herds which are submitted to these measures is about 200 000. From East Prussia the voluntary control of cattle tuberculosis spread almost all the provinces and has also gained a sure footing abroad: in Poland, Russia, etc. The State control of tuberculosis is based chiefly on the experience gained in East Prussia; it came into force on May 1, 1901, in the new law on cattle diseases.

Some farms already use milking machines. Though it is undeniable that of late years they have been much improved, I am of opinion that they can never take the place of a good milker and can only be considered a resource in time of need which is useful when no suitable hands can be engaged. It must not be forgotten that the high production of milk of cows is not a gift of nature, but rather a quality which has been artificially induced in them to a great extent by the stimulus of hand milking. A milking machine is capable of handling an udder like an experienced milker, nor is it capable of considering the individuality of each animal. Important is this question, that all the efforts made in the several districts for the improvement of hand milking and the institution of milking clubs should not be neglected but unweariedly furthered.

The so-called control associations, whose task it is to determine the quantity of milk produced by the individual cows of their members, and its content, together with the corresponding quantities of fodder consumed, spread very rapidly. In the kingdom of Prussia there are at present about 500 such associations in existence, with a membership of 7 500 farms possessing 220 000 cows. That this system of control is one of the powerful factors in the improvement of the milk yield of our cows is generally recognized.

Among the various ways of utilizing milk, the direct consumption as food has, during the last decades, increased considerably; as previously stated, it accounts for 43 per cent. of all the milk produced. In late years a number of labourers' families have left the country,

where they were provided with milk from the cows they kept, and has taken up their abode in large towns and industrial centres, remaining consumers of milk. Not only the absolute consumption of milk, but its relative consumption per inhabitant has increased, as is proved by statistics. As for the causes of this fact, they are to be sought in the anti-alcohol agitation which has reached the working classes; in the successful propaganda for increasing the consumption of milk, which was started about 10 years ago, in the retail sale of milk in factories, schools and in the milk booths in the streets, and most of all in the higher wages of workmen and the better living. This increase of milk consumption is a matter of satisfaction, as it makes for the better and cheaper feeding of the people: the most valuable food stuff, protein, is four times as cheap in milk as in meat.

With the constant growth of large towns, the task of providing them with milk becomes increasingly difficult, as it has to be conveyed from greater distances. In such cases the milking is carried out with the utmost cleanliness, the milk is immediately passed through a cottonwool filter and cooled to 1 to 3° C. (34 to 39° F). During carriage it is kept as cool as possible. None of the other proposed methods for preserving milk have proved advantageous in practice.

If, during the last ten years, the milk supply of large towns has so considerably improved, and the mortality of infants has sensibly diminished it is to a great extent due to the fact that in large towns the sale of milk is carried on by large firms whose arrangements are in harmony with modern requirements and who earnestly strive to conform to the best of their ability to the dictates of hygiene; all the herds which supply them with milk are submitted to the anti-tuberculous process recognized by the State, the milk on delivery is carefully examined as to its cleanliness, freshness, degree of acidity, fat content, etc.; it is cleaned by centrifugation, then pasteurized in order to destroy any germs of disease it may contain and to improve its keeping qualities, after which it is cooled by means of ice machines and kept at a low temperature till sent off. The consumer gets the milk sent to him in carts so constructed that any tampering with the milk by the carrier is rendered impossible. A certain amount of milk is sold in suitably closed bottles. As the great majority of our babies just at the most critical period of their existence are not suckled by their mother but nourished on cows' milk, it is of the highest economic importance that this food should reach the consumer in the best possible condition, and this can only be accomplished by well appointed large firms, which thus act as institutions for the protection of babies.

In the working up of milk the first thing to be noted is that the improvement of milk separators, which are the most important dairy machine, is being continuously and actively pursued. The number of separators in work in Germany is over 370 000. They are to be met with not only where butter is made, but also in many farms which send the separated cream to the dairies. This production of cream has spread, especially in those districts where large estates are prevalent. In the large butter factories the improved methods suggested by science and practice are adopted.

cream is pasteurized in order to improve the quality and keep it butter and to obviate the unfavourable influence of certain foddors; factories start it with pure cultures of lactic acid bacteria and cause the ripening to take place in so-called cream ripeners, which allow the temperature to be regulated to a nicety; they use churns in which the butter is made and worked up, and with which even large firms can churn all their cream in one operation, as in the largest of these churns (Butterfertiger) as much as 440 gallons of cream can be worked at a time. Apart from other advantages, they lead also to a great saving of time and labour. The efforts of the dairies to improve the quality of their product are the more satisfactory as foreign competition becomes keener every year, and in many quarters the demand arises for the introduction of a trade mark for home butter. The granting of a patent for the "Friwi" buttering process has caused dissatisfaction in the trade; this process consists essentially in maintaining the cream about 24 hours near freezing point, warming it to 18 or 20° C. (64 to 68° F.) and mixing it with 10 per cent of starter; this addition is repeated after 4 to 6 hours and then the cream is cooled to 10 to 13° C. (50 to 55° F.) and allowed to ripen at this temperature for about 18 or 20 hours, so that it is 48 hours old when it is churned. It seems difficult to understand how a process so long known to have been patented. As it does not lead to a greater yield of butter, not likely that many dairies would be inclined to pay royalties for it. In cheese making also notable progress has been made, but this branch of dairying has not undergone so deep a change as butter making. Of hundreds of dairies which have arisen during the last decades, only a relatively small number makes cheeses, because this industry is attended with greater risks; it is also more exacting as to the composition of the milk, requires more labour and pains, greater knowledge and experience and its products are not immediately saleable like butter. In North Germany it is only in a few localities that many cheese dairies are to be found; such are the fertile plains of East and West Prussia and the Rhine province. During recent decades more interest has been awarded in cheese making in Schleswig-Holstein than was formerly the case. Elsewhere in Germany cheese dairies are found isolated. In South Germany cheese making is much more important, especially in Bavarian Allgäu. In West and Central Germany there are a number of curd cheese factories (Käsefabriken); these, however, are not considered as real cheese factories because they only buy the freshly pressed curd from the dairies and work it up into several kinds of sour cheeses. Though these cheeses are only a low value, they are not to be despised as food for the people. It is further worthy of mention that the production of imitations of the soft cheeses, such as Camembert, Brie and Neufchâtel, is increasingly practised; as in these cheeses the milk fetches high prices it is a temptation to be welcomed. Considering that a dishonest competition has made itself felt in the cheese trade, efforts are being made to prevent cheeses made from skimmed milk being sold as half-fat cheeses, or these latter as whole-milk or cream cheeses.

The preparation of milk powder or dried milk, which has been known since the middle of the last century, has developed of late years, especially in East Prussia. It is connected with the rapid rise of the chocolate industry, as the dried milk is chiefly used in the preparation of milk chocolate, cakes and biscuits, besides being used in the household for puddings. It is, however, no substitute for fresh milk as its makers claim. In this respect it is decidedly inferior to condensed milk, which next to butter and cheese is the most important milk product and serves especially for consumption on board ship and in the tropics. Unfortunately, it is only produced in small quantities in Germany. As in condensing milk a portion of the water is subtracted, the casein has not lost its power of dissolving in water, so that this product, by the mere addition of water, can be reconverted into milk. It can thus be utilized in many more ways than milk powder and has an immensely larger market ready for it, while the rapidly increased production of milk powder seems to have almost outpaced the demand.

Recently the extraction of casein from skimmed milk has somewhat increased. It is used in the industries and also in the preparation of articles of food. Among the former, paper, colours and adhesives are the chief. When treated with metal salts and formaldehyde, galalith is the result. This, according to the substances added, gives a good imitation of cellulose, ivory, coral, tortoiseshell, etc. It is easily worked and polished and is not inflammable like celluloid. From casein, artificial silk and horsehair films and shoe creams are made. Besides the above, a whole series of food preparations are based on casein: nutrose, eukasin, sanose, and lactogen, plasmon, enlactol, etc., which are sold at disproportionately high prices; thus for instance one pound of sanotogen costs 13s 4d.

From skimmed milk a substitute for Liebig's extract of meat can also be made; the process is based on the fact that in the ash of milk the same substances are found as in meat. Hitherto, however, this process has not been applied to any great extent. A few dairies prepare milk soap from condensed skimmed milk.

Some large cheese factories find it profitable to extract the milk sugar contained in their whey; this sugar is used in the preparation of medicines for the nourishment of infants and in the industries. One factory produces lactic acid from whey.

To the formerly known lactic acid beverages, kéfir and kumiss, another has lately been added, namely yoghurt. The use of this has spread very much, as it is credited with preventing infection of the intestines and being consequently conducive to health. Yoghurt, as is well known, is the national beverage of the Bulgarians. As a proof that the daily regular use of Yoghurt is especially wholesome, it is stated that in Bulgaria with its 4.3 million inhabitants there are more nonagenarians than in the whole of the German Empire.

That dairying in Germany is in a most flourishing condition, that it has already achieved extraordinary progress and that this is due to the increasing activity of dairy advisers, teachers and experts, is admitted by

one. What investigators in this field justly complain of is the want of a sufficiently endowed central institute capable of solving several serious problems. Institutes existing at present cannot cope with many questions being handicapped by want of time, of sufficient staff, of experimental material and cattle, of a dairy entirely at the disposal of investigators, and last but not least, by the want of money. This want is all the more to be regretted as other agricultural industries such as brewing, distilling, and wine making, beet sugar manufacturing and milling, which, unlike dairying, have emancipated themselves from farming, have long since had for a long time past such central institutes, notwithstanding the fact that the value of their produce is considerably less than that of dairying. In smaller States, such as Holland, Sweden, Switzerland and several of the North American Republics, are in this respect much better than Germany. The demand for an imperial institute for dairying is therefore to be regarded as completely justified.

SECOND PART.
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1313 - Swiss Law of June 9, 1913, concerning the Control of the Commerce in Manures, Feeding Stuffs, Seeds and other Products useful to Agriculture and Allied Industries, by the Federal Stations of Agricultural Experiment and Analysis. (Verordnung betreffend die Ueberwachung des Handels mit Düngemitteln, Futtermitteln, Sämereien und andern in der Landwirtschaft und den Nebengewerben Verwendung findenden Hilfstoffen durch die Schweizerischen landwirtschaftlichen Versuchs- und Untersuchungsanstalten — Vom 9 Juni 1913. SCHULZE (Département fédéral de l'Agriculture). — *Landwirtschaftliches Jahrbuch Schwyz*, Year XXVII, Part 5, pp. 309-324. Berne, 1913.

The Commission of Control of the Stations of Agricultural Experiments and Analyses of the Federal Department of Agriculture has considered and approved a law for the control of the trade in feeding-stuffs and manures. This law will come into force on the first of January 1914 and will supersede the law of the tenth of June 1903.

The chief points dealt with are as follows :

General Provisions :

- § 1. Firms under control and their certificates of guarantee.
- § 2. Procedure required for certification.

Special Provisions :

- A. Inspection of trade in manures, forage crops and other materials.

1. *Control analyses.*

- § 3. Control fees.
- § 4. Guarantees.
- § 5. Gratuitous analyses. Control certificates.
- § 6. Drawing and despatch of samples.
- § 7. Results of analysis.
- § 8. Appeals.
- § 9. Indemnities.

II. *Other Analyses.*

§ 10. Despatch of samples.

§ 11. Scale of charges.

§ 12. Reduction of prices.

B. Protection of trade in seeds.

I. *Control Analyses.*

§ 13. Control Fees.

§ 14. Guarantees.

§ 15. Gratuitous analyses. Control certificates.

§ 16. Drawing and despatch of samples.

§ 17. Results of analysis.

§ 18. Appeals.

§ 19. Indemnities.

§ 20. Selectors and establishments for seed-selection in Switzerland.

II. *Other Analyses.*

§ 21. Despatch of samples.

§ 22. Scale of charges.

§ 23. Reduction of prices.

C. Conference of experts on questions connected with the Control.

§ 24. Aim.

§ 25. Composition.

§ 26. Powers.

This law concerns chiefly manufacturers, companies, merchants and persons with an interest in the control certificates. Its provisions are effected by the Central Administration of Swiss Stations of Agricultural Experiments and Analyses at Liebefeld, near Berne, with the object of controlling the trade in manures, fodder and other materials used in agriculture. The firms which reap the advantages shall be known as "controlled firms" (1).

The conditions of the contract are as follows :

(a) Controlled firms undertake to observe in every point the provisions of the law.

(b) They undertake to indicate, in compliance with the law, the guarantees of all goods and to deliver gratuitously to their customers the certificate of control filled in according to instructions.

(c) The purchasers of goods from a controlled firm have the right to a gratuitous analysis by the Federal authorities above-mentioned, under the conditions stipulated in the law and without further formalities.

(d) The controlled firms shall recognise the analyses made by the authorities as final in regulating the price for the purchasers except in the case of appeal; when the analysis is of composition inferior to that guaranteed, they shall indemnify the purchaser.

The controlled firms shall undertake to describe their products and to forbid to use names likely to lead to a misunderstanding of their

(1) This principle is already in force in several of the United States of America, and is embodied in the "Model Fertiliser Law" proposed by Hopkins and conforming to the views of the Association of American Agricultural Colleges and Experiment Stations. (See *Proceedings XII Annual Convention*, p. 128, 1906; *Proceedings XXIV Convention of the Association of Agricultural Chemists*, p. 100, 1907, and HOPKINS, C. G., *Soil Fertility and Permanent Culture*, Appendix, p. 599, 1910). (Ed.).

real value on the part of the purchaser. They are also forbidden to put on the market products of secret composition. Each year the Administration will publish a list of the firms controlled and the products sold by them. Firms which do not submit to regular control or continue to place inferior products on the market will be removed from this list. (See § 21.)

The annual revenue of the control service is estimated on a basis, every 10 metric tons of produce sold to purchasers resident in Switzerland, the rate of 1.50 frs. (1s 3d) for manures containing a single fertilising ingredient and 2.50 frs. (2s) for mixed manures and feeding-stuffs, with a minimum of 50 francs (£2) in the case of Swiss firms. On foreign firms the tax are respectively 2.50 (2s) and 3 frs. (2s 6d), and the minimum 100 francs (£4). The annual amount due must be paid before January 10 of the following year, reduction of 20 per cent. being allowed for quantities exceeding 500 wagons. In the case of seeds the annual control tax will be fixed by contract, the minimum being 25 francs (£1) for Swiss firms and 50 francs (£2) for foreign firms, the amount to be paid in advance. (See § 3 and § 11.)

The guarantees given by the controlled firms for goods sold must comprise :

In the case of manures :

- (a) Purity and freedom from adulterations ; suitability of texture.
- (b) Freedom from substances injurious to plants.
- (c) The content of useful constituents, indicated as percentage, when the purchaser of the goods is not made on the results of the analysis.

The guarantees of quality and composition refer to :

water-soluble phosphoric acid (P_2O_5) ;
 ammonium-citrate soluble phosphoric acid (P_2O_5) ;
 citric-acid soluble phosphoric acid (P_2O_5) ;
 nitrogen as ammonia (N) ;
 nitric nitrogen (N) ;
 organic nitrogen (N) ;
 total nitrogen (N) ;
 water-soluble potash (K_2O) ;
 lime (CaO) ;
 other substances as required ;
 the fineness of grinding ;
 suitability for spreading ; degree of dryness and physical condition (fine or coarse).

The minimum composition must be :

superphosphates : 10 per cent. water-soluble phosphoric acid.
 mixed superphosphates : 4 per cent. water-soluble phosphoric acid.
 mixed nitrogenous manures : 1 per cent. nitrogen (in a form which must be indicated).
 mixed potash manure : 2 per cent. water-soluble potash.

In the case of ammonium-citrate soluble phosphoric acid of mixed or double superphosphates, and also in the case of the undissolved phosphoric acid of bone superphosphates, guarantee must be at least 2 per cent. For mineral superphosphates only the water-soluble phosphoric acid is guaranteed.

Feeding-stuffs:

- (a) Genuineness, purity and freedom from adulteration.
- (b) Good keeping qualities, absence of injurious substances; the normal constitution of food.
- (c) In the case of oil-cakes, cake-meals and other concentrated foods, amounts of protein contained; in the case of molasses the percentage of sugar and the nature of the protein; in the case of dried foods such as potato flakes, the percentage of dried substance; in the case of phosphates of lime to be used as food the percentage of ammonium-citrate-soluble boric acid.
- (d) For other feeding-stuffs, and in the case of wagon-loads of the foods mentioned under (c), guarantees shall be fixed by agreement with the buyer. In the case of feeding meals and starchy foods the vendor may guarantee the percentage of starch.

Other Substances used in Agriculture:

For sulphur, sulphate of copper, sulphate of iron, etc., the guarantee, besides genuineness and normal composition, must refer to the active substance. (See § 4).

Seeds:

- 1) A minimum percentage of authentic and pure seeds, and the source of the seeds.
- 2) A minimum percentage of authentic seeds, and a definite germinating capacity.
- 3) The freedom from dodder (*Cuscuta* spp.) of all leguminous seeds, such as clover, lucerne, birds-foot trefoil, mellilot, etc.
- 4) The freedom from flax dodder (*Cuscuta Epilinum*) of flax and spurrey.
- 5) The percentage of burnet (*Poterium Sanguisorba*) in sainfoin.
- 6) By special agreement between the parties, the firms shall guarantee the freedom from injurious seeds, such as dock (*Rumex*).
- 7) The guarantee of purity and germinating power to be expressed as percentages of the weight; thus the vendor guarantees the number of kgs. of authentic and pure seeds.
- 8) present as a minimum in 100 kgs. of the goods, and the minimum of seeds capable of germination in 100 pure seeds (germination capacity).
- 9) The controlled firm must guarantee all goods sold, even if their exact quality and origin is not known; in this case the vendor and the purchaser fix beforehand the price of pure seed capable of germination, and the seed is paid for according to the results of analysis.
- 10) Also in the case of sale on sample, the purchaser must send to the Control Station proof of the seed offered and of the actual goods delivered.

In order to establish the identity and genuineness of seeds difficult to identify, such as the different species of *Brassica*, *Trifolium*, *Medicago*, the Control Station carries out culture tests, the results of which are considered final. The vendor must give guarantees to this effect. (See § 14). The practical application of the law is effected by means of "control certificates".

Control analyses of manures and feeding-stuffs are made gratuitously, according to agreement with the controlled firms, on the following conditions:

- (a) that it is shown by a certificate of origin that the goods are the product of a control firm ;
- (b) in the case of one class of goods the purchase value must be at least 50 frs. 8 except for quantities in excess of 500 kg. (10 cwt).
- (c) The drawing and despatch of samples must be made according to prescriptions

The controlled firms must enter in the certificates of gratuitous analysis (on printed forms supplied free by the Central Administration) the following particulars :

- (a) name and address of the purchaser ;
- (b) name and stamp of the controlled firm, and, if necessary, also the name of its representative ;
- (c) date of despatch of the goods from the firm ;
- (d) exact description and weight of the goods, and the price if the weight does not exceed 500 kg. (10 cwt) ;
- (e) number of wagon, in the case of full wagon-loads ;
- (f) the guaranteed percentage of the goods as sent out, and not of the dry substance (See § 5).

The sampling must be carried out either by the authorities or by the purchaser or his agent, in the presence of the vendor or an impartial witness, in enjoyment of civil rights and acquainted with the provisions of the law. The despatch of the sample should not take place more than three days after the arrival of the goods.

The following instructions are given for obtaining an average sample. In the case of manures and feeding stuffs, samples of at least 2 kg. (4 ½ lb.) should be taken from the sacks, barrels, boxes, etc. (if possible with a sampling tool). A partial sample must be taken from every tenth sack, barrel, box, etc. or if the consignment comprises less than 50 packages, then from at least every fifth package ; if there are less than five packages, each one should be sampled. The samples should be taken from different parts of the mass and not only from the surface. They should not be taken from sacks whose contents have deteriorated or become damp in transport. If the goods are in a heap, the sample must be taken from in the mass, and not from the surface. These partial samples must be carefully mixed on a clean dry surface and all lumps should be broken up. From this mixture three clean and dry wide-mouthed bottles of about ½ kg. (1 lb.) capacity must be filled immediately ; they must be corked and sealed with wax or lead ; the seal and dies must not be available to the purchaser. In the case of cattle cakes, six must be taken from various places and reduced to pieces of the size of nuts. In the case of dry foods, samples must be packed in clean tin boxes, or in wooden or cardboard boxes. If the consignment comprises several wagons, samples must be taken from each wagon. Lastly, if various parts of the consignment show damage, separate samples should be taken from them. In every case one of the three samples is to be sent to the Station with the free certificate of control, while the other two (reserve samples) are retained by the purchaser.

The samples for analysis should be sent post-free to the Federal Station of Agricultural Chemistry of Zürich, Berne or Lausanne, according to the district. (See § 6).

With regard to seeds, control analyses are made gratuitously according to the following conditions (see § 15):

- (a) for every one variety the minimum quantity purchased must be 5 kg. (11 lbs.), and for market-garden crops, for which it is 1 kg. (2 $\frac{1}{4}$ lbs.), and cereals for which it is 25 kg. (55 lbs.);
- (b) that it is shown by a certificate of origin that the goods are the product of a controlled source;
- (c) the drawing and despatch of the sample to be according to the prescription.

The drawing of the samples is carried out in the same manner as for feeds and feeding stuffs, except that the mean sample is taken from the whole bulk, carefully mixed, of each variety. When it would be impossible to take too long to mix the lot, samples should be taken from various parts of each sack and carefully mixed. Samples must be sent in a strong bag closed with sealing-wax or lead. The samples are sent post-free in minimum quantities as follows: grasses and similar seeds, 50 gms. (1 $\frac{1}{2}$ oz.); clovers, seeds of conifers, beets and similar seeds, 100 gms. (3 $\frac{1}{2}$ oz.); cereals, sainfoin and other large grains, 250 gms. (9 oz.). For determinations of the weight per unit-volume: samples of oats and bearded rye, 1 $\frac{1}{4}$ l. (just over 1 quart); of other seeds, $\frac{1}{2}$ l. (nearly 1 pint). Samples are sent post-free to the Seed Control Station at Lausanne or to the Station at Zürich. (See § 16).

The guarantees are certified by the results of the analyses which are free by post to both parties, or by telegram or telephone at the expense of the party requesting it. Both parties can appeal against the results on the grounds of defective analysis, defective sampling, or unless of consignment not allowing agreement with the samples analysed through the analysis be correct. Analysis of one of the reserve samples made by the same Station, and a decisive analysis by the other, the expenses to be paid by the defaulting party. (See §§ 7, 8, 17, 18).

If the analysis shows a defective composition, the purchaser is entitled to return the goods and to repayment of the purchase-money together with costs and compensation. If the percentage composition is below standard, the controlled firm must refund the difference in value. The following variations in percentage composition are allowed:

For manures:

Water-soluble or total phosphoric acid	0.5 %
Citric-acid or ammonium-citrate soluble phosphoric acid	0.75
Nitrogen in manures containing less than 5 per cent	0.3
Nitrogen in manures containing 5 per cent and more	0.5
Potash	0.5
Fineness of grinding of basic slag	5.0
Calcium sulphate	2.0
Calcium carbonate	2.0

For feeding-stuffs:

Crude protein	2.0
Crude fat	0.5
Sugar in molasses feeds	2.0
Starch	2.0
Presence of earthy matter in cakes and cake meals, except in the case of agreement between the parties	2.0
Presence of lumps in cakes and cake meals, except in the case of agreement between the parties	2.0

When the above variations are exceeded, the compensation must be calculated on the total difference in the percentages guaranteed and the results of analysis, except in certain special cases. (See § 9).

The variation allowed in the case of seeds is fixed at 5 per cent. of the value of utilisation calculated according to the formula $\frac{G \times P}{100}$, where P represents the purity and G the germinating capacity. Special conditions are imposed for the presence of dodder in clover and of burnet in sainfoin. (See § 19).

For analyses of soils, manures, seeds and other products, a special discount of 50 per cent. on the established charges is allowed to Swiss Stations of Agriculture and Forestry, and to agricultural authorising societies and syndicates, as well as to Swiss farmers requiring analyses for their own use.

Seed selection firms selling their products in Switzerland are partial or totally exempt from the expenses of control, if they submit to the conditions imposed on controlled firms and sell at least 250 kg. (550 lbs.) of cereals or other large seeds and at least 25 kg. (55 lbs.) of seeds of beet, clover, grasses and others. The Experimental Stations have further the right to inspect fields or stations for selection, and to exclude seeds which do not conform to the conditions. (See § 20).

Finally, the Federal Department of Agriculture, responsible for the carrying out of this law, is assisted in this work by the Control Commission of the Federal Stations of Agricultural Experiments and Analyses. It may also summon special congresses of experts for the discussion of questions raised in the carrying out of the law. The constitution of the congress is normally as follows: the members of the Commission of Control, the Central Administration and the chiefs of Federal Stations of Agricultural Experiments and Analyses; the representatives of controlled firms. The particular members of any one conference will be nominated according to the subject under discussion.

The special subjects for discussion will be:

1. Definition of terms, such as purity, genuineness, freedom from adulteration, products of secret composition.
2. Exact description of the goods.
3. Determination of the rules concerning quality, guarantee and control of goods, especially new products.

4. Calculation of compensation for goods below analysis delivered by controlled firms; determination of various points concerning the price of certain active principles.

5. Examination of differences between controlled firms and Federal Commissions of Agricultural Experiments and Analyses concerning questions relative to manufacture, to the trade and to the calculation of compensation. (§ 24, 25, 26).

Reorganization of the Superior Council of Agriculture in France. — Décret du 15 juillet 1913, portant réorganisation du conseil supérieur de l'agriculture. — *Bulletin de la Société des Agriculteurs de France*, Year 1913, No. of Sept. 1, pp. 143-44. Paris, September 1, 1913.

According to the text of the Decree of July 15, 1913, concerning the reorganization of the Superior Council of Agriculture in France, the council shall give its advice on all problems proposed by the Minister of Agriculture and which particularly concern agricultural legislation, measures for the encouragement of agricultural production, questions of agricultural sociology, political economy, duties and import tariffs.

The members of the Council shall consist of three kinds: *ex officio* members, elected members and members nominated by ministerial decree. *Ex officio* members are the presidents of the Agricultural Commissions of the Senate, and of the Chamber, the general directors and heads of divisions of the different branches of the ministerial administration. The Academies of Sciences and agricultural associations elect one of their members representative to the Council, and the 12 external services connected with the Ministry of Agriculture also each elect one of their officers as a representative. The Minister also nominates 60 members chosen for distinguished work in pure or applied agricultural science, and 25 members distinguished in the economic and social services. The members are elected or nominated for three years and are indefinitely re-eligible.

The Council assembles at least once a year under the presidency of the Minister of Agriculture, who convenes the assembly.

The Council has the right to elect a Permanent Commission composed of *ex officio* members and 25 others, of whom 10 are elected by ballot and the rest nominated by the Minister.

Law and Regulations rendering Attendance at Local Extension Schools obligatory in the Provinces of Brandenburg, Pomerania, Saxony, Schleswig-Holstein, Westphalia, in the Rhine Province and in Hohenzollern territory. — *Ministerialblatt der Königlich Preussischen Verwaltung für Landwirtschaft, Domänen und Forsten*, Year 9, No. 10, pp. 303-309. Berlin, October 1913.

The present law of May 19, 1913, confers on the communes of the above-named provinces the right to render by means of communal decree, the attendance at a local extension school during three consecutive winter half-years compulsory on all male persons under 18 years of age and no longer subject to obligatory attendance at other schools. This right existed already in the provinces of Hesse-Nassau, Hanover and Silesia.

The regulation attached to this law gives details as to the persons subject to this compulsion and as to the curriculum and general plan of construction of these local extension schools; it contains, in an appendix, draft of a communal decree regarding these schools.

1316 - Position and Conditions of the Prussian Rural Continuation Schools during the Financial Year 1912 (1). — *Zeitschrift für das ländliche Fortbildungswesen in Preussen*, Year 5, Part 1, pp. 1-19. Berlin, October 1913.

In the year 1912 there existed in the kingdom of Prussia 602 rural continuation schools. Of this number, 265 were instituted by district (Kreise), 4610 by communes, 32 by Agricultural Associations and 1284 by private persons and other agencies. The expenses entailed by these schools were defrayed in the case of 11 by the districts alone, in that of 20 by the communes alone; by the State alone in 1843 cases, by the State in conjunction with other interested parties in 4263 and by private persons and other agencies in 47. The number of self-supporting schools was seven.

The total cash expenses, not including upkeep, heating and lighting and cleaning the schools, amounted to £ 50 360.

The number of pupils was 98315, that of the teachers 8587. Of the latter 8137 were elementary school teachers. Of the schools, 6092 were open only in winter, 99 throughout the year.

As compared with the preceding year 1911, the number of these continuation schools has risen in the whole State of Prussia from 534 to 610. The total number of pupils rose from 86689 to 98315. In 1911 the average number of pupils per school was 16.2 and in 1912, 15.9. For the year also a further considerable increase in the numbers of schools and scholars, especially the latter, is expected in consequence of the law of May 19, 1913. (2).

1317 - Practical Schools of Agriculture in Uruguay. — OTAMENDI, JOSÉ in *Revista del Ministerio de Industrias*, Year 1, No. 2, pp. 57-64 and No. 3, pp. 37-66. Montevideo, June and July 1913.

In this paper the writer makes some suggestions as to the methods to be followed in teaching in the practical schools of agriculture founded at Paysandu, Salto and Cerro Largo by the law of September 1911. His suggestions deal with the general and special trend of the farms attached to the schools, respecting the farming, live stock keeping, wine-making, fruit-growing, market gardening and agricultural industries. He draws up a detailed plan for institution of agricultural experimentation on crop and live stock, agricultural chemistry and so forth, and on the observations to be made on the economic conditions of the agriculture of the country (on conditions of land tenure and production, means of transport, colonisation, immigration, and agricultural credit).

(1) See No. 2, B. Jan. 1913.

(2) See preceding article (No. 1315).

Local Extension Schools and Agricultural Winter Schools. — BISCHOFF, *report in Das Land*, Year 22, No. 1, pp. 3-6. Berlin, October 1, 1913.
Observations on the aims and tasks, object and manner of teaching, preparation of the teachers of the local extension schools and of the agricultural winter schools, and the relative position of these schools to each other.

Agricultural Shows.

Australia: Queensland.

Feb. 4-6. Stanthorpe. — Agricultural show.

France.

Jan. 30-Feb. 3. Paris. — Fifteenth International Poultry Show, organized by the "Société des Aviculteurs français". Address: 46, rue du Bac, Paris.

Feb. 16-26. Paris, Grand Palais des Champs Elysées. — General agricultural show, including: 1) fat cattle, sheep and pigs; 2) fat poultry; 3) live poultry and rabbits; 4) dairy produce (butter and cheese); 5) agricultural and horticultural produce; 6) wines, ciders, perries and brandy; 7) work dealing with agricultural mutuality; 8) exhibition of materials (packing and poultry). To this show will be annexed an exhibition of instruments, machines and apparatus for mechanical cultivation to be held at the "Esplanade des Invalides", Feb. 16-23. Programmes may be obtained from the Ministry of Agriculture, 78, rue de Varennes, Paris.

May 1. Nov. 1. Lyons. — International Urban Exhibition, with section reserved for silk and silk goods.

June. Paris. — General show of breeding stock: cattle, sheep, pigs and sheep-dogs.

Germany.

May 21-24. Birnbaum (Posen). — Agricultural show.

June 11-17. Stettin. — Great agricultural show; live stock section closes June 14.

June 19-22. Stettin. — Provincial show organized by the Chamber of Agriculture. Will include agricultural and dairy produce and machines and utensils.

June 27-29. Trebnitz (Silesia). — Live stock show. A show of agricultural machines and utensils and of agricultural and horticultural produce will be annexed.

Autumn. Sesslach (Upper Franconia). — Live stock show of the district, and exhibition of agricultural implements.

Uruguay.

May. — The Live Stock Department of the Government, in conjunction with the "Banco Agrícola", is organizing a show and sale of cattle, chiefly with the object of encouraging foreign breeders to introduce choice stock into the Republic.

Russia.

Sept. 6-9 (Aug. 24-27 old style). Mitau (Courland). — Agricultural show organized by the "Kurländische Oekonomische Gesellschaft in Mitau". Will probably be held yearly about this date. Address to: "Geschäftsstelle der Ständigen Ausstellungs-kommission", Berlin, N. W., Roonstrasse, 1.

Spain.

May. Tortosa. — International agricultural show, and congress of the "Federación Agrícola Catalana Balear".

Sweden.

June 15-21. Malmö. — Agricultural Show for Scania, to celebrate the centenary of the foundation of the Agricultural Societies of Malmöhus and Kristianstad. General secretary: G. Leufvén, Malmö.

Switzerland

1918. Geneva. — *Exposition Internationale* for new plants, on the occasion of the 60th anniversary of the foundation of the Geneva Horticultural Society.

United Kingdom.

1914. March 10-12. London. — Spring show of the Hunters Improvement and National Horse Breeding Society.
 June 4-16. London, Olympia. — International Horse Show. Sec.: Frank F. Russell, Hanover Square, London, W.
 June 30-July 4. Shrewsbury. — Show of the Royal Agricultural Society of England.
 July 14-17. Hawick (Scotland). — Show of the Highland and Agricultural Society.

United States.

1914. Feb. 10-24. Dallas, Texas. — National Corn Exposition.
 1915. San Francisco. — International Live Stock Show (Section of the Panama-Pacific Exhibition). The prizes in the live stock section will amount to \$175 000, as follows: horses, \$50 000; cattle, \$50 000; sheep and goats, \$25 000; pigs, \$25 000; poultry, etc., \$12 500; car-loads of live stock, \$7 500; dogs and cats, \$5 000. Additional prizes amounting to \$100 000 will be given by a number of American societies. The dates are not yet definitely fixed, but the following is the proposed arrangement:

	Date of show	Last date for entries
Horses, asses, mules	Oct. 1-12	Sept. 1
Cattle	Oct. 24-25	Sept. 10
Sheep, goats, pigs	Oct. 27-Nov. 4	Sept. 15
Poultry, etc.	Nov. 15-17	Sept. 20
Car-loads of animals	Nov. 8-12	Oct. 1
Cats	Nov. 21-24	

1920 - Agricultural Congresses.

1914. Berne. — International Tuberculosis Conference.
 1914. Feb. 17-19. Paris. — Congress of the "Société nationale d'encouragement à l'agriculture".
 1914. April 14-17. Paris, Sorbonne. — Fifty-second Annual Congress of the Learned Societies of Paris and the Departments, under the patronage of the Minister of Public Instruction.
 1915. Christiania. — International Tuberculosis Conference.

CROPS AND CULTIVATION.

1921. — *The Distribution of Atmospheric Impurities in the Neighbourhood of an Industrial City*. — CROWTHER, C. and STEUART, D. W. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 391-408. Cambridge, October 1913.

During the twelve months July 1911 to July 1912, samples of rain-water were collected at 14 different points within and surrounding the city of Leeds as a means of estimating the relation between the purity of the atmosphere and the degree of pollution of the rain-water. The stations were so arranged as to give a complete ring of stations on a circle of 10 miles radius from the centre of the city, whilst to the north, north-east and east additional stations were selected at distances of five miles and ten miles respectively from the centre. Leeds is bordered in all directions

at the three above mentioned by a thickly populated industrial area, mining and iron working prevailing to the south-east and south, and leather manufacturing to the south-west and west, whilst large engineering works are situated throughout both areas. Little was to be gained thereby collecting samples more than three miles out in these directions, the existence of heavy and varied pollution would almost hope-complicate the interpretation of results. The following table summarises the analyses of rain-water.

Collecting station	Rainfall inches	Lbs. per acre.			
		Total suspended matters	Sulphur expressed as SO ₂	Chlorine	Nitrogen
.....	33.2	72	128	44	6.7
.....	33.1	104	192	59	9.1
.....	30.1	175	218	53	5.9
7	31.0	126	162	46	6.6
5	29.4	150	168	43	9.1
3	30.5	120	186	45	8.5
.....	29.1	122	168	43	6.6
.....	28.7	212	171	50	8.0
.....	27.8	200	207	54	7.9
.....	25.8	353	357	63	8.9
.....	28.2	286	269	47	9.3
.....	32.7	239	268	56	8.0
.....	30.4	292	284	56	8.7
.....	28.3	194	380	70	7.4

* N. 7 = station 7 miles to the north, etc...

The rainfall shows a variation of 20 per cent., and is highest on the hilly part of the city, to the west and to the north. The total suspended matters and the sulphur in the rain water together are a very good indicator of the degree of air pollution. Considering these figures first: in the above table all stations on the three-mile ring show figures and the more pronouncedly industrial districts (S. E. 3, etc.) show higher than the districts lying to the north and north-east. Further, there is a sharp falling off in pollution on passing away from the city north-

wards or north-eastwards but a much more gradual fall in passing eastwards owing to the influence of the prevailing westerly winds, although there is a certain degree of complication in that this easterly line of station is situated just on the northern fringe of the coal-mining area; lastly, stations even seven miles out in the cleanest direction show a very polluted atmosphere.

Chlorine, on the other hand, does not appear so reliable a guide as sulphur, and the nitrogen figures are liable to be influenced by external factors, such as leaves, bird droppings, etc.; but they too show the general tendency to be higher in the industrial districts.

The percentage of tar in the suspended matter, of organic nitrogen in the total nitrogen, and of sulphate in the total sulphur, indicate in a general way that the smoke though greater in quantity is in a higher state of oxidation in the dirtier or more industrial districts, owing to more efficient combustion of the coal.

With regard to the effects of smoke on vegetation, no general effect upon the opening of tree buds could be detected, but throughout the polluted area to the south and to the west a considerable proportion of leaves of trees were badly damaged before they had been expanded a month while in the cleaner districts to the north and north-east no appreciable leaf damage could be detected at this period, and, as the season advanced the damage became accentuated in the polluted areas.

Evidence was also obtained in confirmation of that adduced by earlier observers that the sulphur content of the leaves of trees may be of useful assistance in the diagnosis of smoke-pollution.

1322 - **The Correlation of Rainfall** - PECK, J. and SNOW, E. C. in *Quarterly Journal of the Royal Meteorological Society*, Vol. XXXIX, No. 168, pp. 307-316. 1st October 1913.

The writers studied the rainfall data (in *British Rainfall*) for 30 stations in the southern and south-eastern part of England during the years 1908-11 and they drew up series of correlation tables between the fall in each month of one year and that in every other month of the year for each of the four years. Then grouping the correlations into smaller tables, they found that the correlation between winter months was considerably higher than that between summer months, or between winter and summer months. Or, in other words, though yet far from being able to give accurate predictions for the rainfall in any month, it would appear that while the *relative* rainfall in December can be predicted from a knowledge of the rainfall in two or three of the previous months with a small degree of probability, that of June and July cannot be foretold with the slightest degree of probability.

10 **Movements of Soil Water in an Egyptian Cotton Field.** — BALLS, W. I.
Journal of Agricultural Science, Vol. V, Part 4, pp. 469-482. Cambridge,
 1913.

3 a selected area (20 metres \times 10 metres) situated in a field adjoining Botanical Laboratory at Giza a series of soil samples was drawn cm. to a depth of 160 cm. during the five months: May 4 to September 12, 1912. The borings were made twice a week and the moisture of the samples was estimated. A crop of Assili cotton was grown here and was planted and cultivated in the conventional manner, an average crop for the land of about 500 lbs. of lint per acre. of the sampling area was purposely reduced in order to eliminate irregularities in the subsoil due to a sloping bed of clay, and the plot chosen made up of the following layers:

Surface to 30 cm. deep	Made soil
30 cm. to 90 cm. "	Stiff clayey soil
90 cm. to 200 cm. "	Loam to sandy loam
Below 200 cm.	Stiff clayey soil

ing the experimental period, irrigation water was applied four times to the land, viz. May 30, June 23, July 17, August 13.

3 results of the analyses are tabulated and set out in the form of Table I. Taking the mean of the three borings made immediately after an irrigation and the mean of the next, the loss of water from the soil during each irrigation period is estimated as shown in Table I.

the season advanced the region of maximum loss gradually descended to the deeper layers following the development of the root; then, in the middle of August, things were reversed, the water-table began to rise and the root-drying effect. Taking the specific gravity of the soil and the total loss of water from the soil per day was calculated for each irrigation sub-period; basing his calculations on previous observations of evaporation and on all the other evidence at his command, the writer distinguished between the water evaporated directly from the soil and the water transpired by the plant, and distributed the total loss as shown in Table II.

3 the result is only a rough approximation, but the very high figure obtained for the transpiration of cotton indicates that more water is required for a cotton crop alone than is available in the Nile during the summer and that therefore the plants must draw on the subterranean water when it is within reach. It does not follow that the subterranean water, though utilizable, is of any advantage to the crop above. The presence of a water table within 3 metres of the surface still implies a danger to the root-system, and a risk of submergence, with all its attendant evils.

3 the writer also concludes from his figures that the effect of the surging of the water-table is felt to an indefinite depth in the same way that a rise in the water-table is noticeable well above the level of the latter owing to a disturbance and redistribution of hydraulic pressure throughout

TABLE I.

Sub-period	Depth in cm.	Water per 100 dry soil						
		20	40	60	80	100	120	140
1	A* May 4-11 . .	18.6	22.6	25.8	31.3	31.4	31.4	30.4
	B " 22-29 . .	7.7	20.3	25.5	29.4	26.9	29.3	29.4
	loss	10.9	2.3	0.3	1.9	4.5	2.1	1.0
2	A June 2-8 . .	22.7	24.2	29.1	30.2	26.9	31.0	31.1
	B " 16-22 . .	7.2	12.0	25.1	30.1	20.3	29.2	31.3
	loss	15.5	12.2	4.0	0.1	6.6	1.8	0.0
3	A June 26 . .	25.3	24.6	27.1	29.3	27.3	29.1	31.7
	B July 10-17 . .	16.3	16.5	15.5	19.5	25.1	27.6	32.0
	loss	9.0	8.1	11.6	9.8	2.2	1.5	+0.3
4	A July 20-27 . .	25.9	23.4	21.3	24.2	27.8	30.3	31.8
	B Aug. 3-7 . .	17.2	15.3	15.7	17.6	17.7	19.2	30.5
	loss	8.7	8.1	5.6	6.6	10.1	11.1	1.3
5	A Aug. 14-21 . .	27.7	23.6	31.7	19.8	21.2	26.3	30.6
	B Aug. 31-Sept. 7 .	21.8	20.5	23.6	32.1	27.3	30.7	31.6
	loss	5.9	3.1	8.1	+12.3	+6.1	+4.4	+1.0

* A = borings after irrigation.
B = " before "

TABLE II.

Sub-period	Total loss of water in tons per acre per day	Loss due to	
		soil evaporation	transpiration
1	11	7	4
2	24	10	14
3	25	4	21
4	36	2	34
5	+ 4	—	—

Mean transpiration = 18 tons of water per acre per day.

system. Further, he points out that unless due regard is paid to seasonal variation discussed in this paper, determination of soil water lent in an Egyptian cotton field by random sampling is almost worth-

4 - **Box Drainage** (1). — BUTZ, A. in *Oesterreichische Moornzeitschrift*, Year 14, No. 9, pp. 134-142. Staab (Bohemia), September 15, 1913.

This new method of draining consists in the use of long wooden drains having a square cross-section. These drains are built of boards, usually feet long, 2 to 8 inches wide, and about $\frac{1}{4}$ to 1 inch thick, nailed together forming a continuous conduit.

In the sides of these drains there are slits through which the subsoil water enters. Several of these drains flow into a common drain of larger dimensions as in other systems of drainage.

Fig. 1 shows a piece of such a wooden drain as well as the arrangement of the board and side slits, the latter from 20 to 40 inches apart. Below, cross sections of the minors and mains are shown. (5 cm. = 2 in., 7 cm. = 2 $\frac{3}{4}$ in., 10 cm. = 4 in., 12 cm. = 4 $\frac{3}{4}$ in., 15 cm. = 6 in.)

Fig. 2 shows the junction of a minor with a main drain situated at a level.

Fig. 3 shows the outflow of a main drain into the main ditch.

For making a wooden box drain, three men are sufficient. Five or six wooden trestles are required; these are trestles bearing on the upper bar some wooden blocks fastened at certain intervals corresponding to the gauge of the drains. Fig. 4 gives the plan and cross section of such a trestle.

The writer describes the making and laying down of such a drain, as well as the advantages it presents over other systems of drainage. Its chief merits are the simplicity and reliability of the operation of laying, on account of the great flexibility of the box drains, which are besides admirably suited to soft moor soils with very slight fall.

Fig. 5 shows a drain being laid and fig. 6 the extremity of a drain being laid on a row of trestles.

5 - **The Effect of Bastard Trenching on the Soil and on Plant Growth.** — PICKERING, S. U. and RUSSELL, E. J. in *The Journal of Agricultural Science*, Vol V, Part 4, pp. 483-496. Cambridge October 1913.

"Bastard trenching as ordinarily performed consists of two distinct operations; loosening the lower spit of soil, and digging into it farmyard manure or other fertilizing material. A considerable volume of data has been accumulated to show the effect of the addition of farmyard manure to soil, but little is known of the effect of loosening the bottom spit, either on the soil or on the plant.

The experiments described in this paper were made on plots which had been bastard trenched to a depth of three spits, but not manured. The first and second spits were put back in their natural order. The experiment,

(1) See No. 229, B. March, 1913.

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"The experiments described in this paper were made on plots which had been bastard trenched to a depth of three spits, but not manured. The top and second spits were put back in their natural order. The experiment,

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therefore, deals simply with deep cultivation effect, and is not complicated by any disturbing factors due to the operation of the manure.

"Four distinct types of soil were investigated; a light sand, two loams (both rather heavy) and a strong clay. The bulk of the experiment extended over the four seasons from March 1909 to the end of 1912, a period which included the unusually hot dry summer of 1911, the cold wet summers of 1909 and 1912, and the season 1910 which was of intermediate character.

"Samples of soil were periodically taken for determinations of moisture and nitrate, and observations were made on the growth of fruit trees in the plots.

"The results show that trenching has very little effect on the moisture content of the soils. There is some indication that it facilitates percolation from the surface to the subsoil on heavy loams and clay, but this indication is not very marked, and only comes out with certainty on looking over the whole of the results. It also somewhat increases the subsoil moisture. No other tendency could be distinguished, and we must regard trenching as a very minor factor in determining the water supply to the plant.

"Nor did it appear to lead to any marked increases in the store of nitrate in the soil. There were small gains on the sand and rather large gains on the clay, which persisted over all the four seasons, but these were never very great, and not much above the error of the experiment. Trenching did not appear to alter the distribution of the nitrate between the surface and the subsoil.

"The behaviour of the plant furnishes a sensitive index to the change in the soil. Here, however, the indications are not much more definite than those given by the determinations of water and nitrate. An increased leaf size (generally of small dimensions) is shown in three out of the four cases in which this feature was measured, but in the fourth there is a reduction. An increased growth was recorded in three cases, but a reduction in two cases; whilst in the two instances where there were records of crops, both are in favour of leaving the ground untrenched. The effect on the growth of trees appeared to depend largely on the character of the seasons following the trenching and planting, as was exemplified by the different results obtained in the same plot of ground after trenching in 1895, and after trenching in 1910.

"The practical conclusion may be drawn that bastard trenching, if done without addition of manure to the bottom spit, is not likely to bring about any sufficient change in the soil to justify the trouble and expense of the operation."

1326 - *The Production of Guano in Chile.* - YUNGER, G. *Estadística Minera de Chile en 1910 encomendada a la Sociedad Nacional de Minería por el Supremo Gobierno*, Vol. pp. 51-52 and 201. Santiago de Chile, 1913.

The total output of guano in Chile since the beginning of its utilization is shown in the following table.

Output of guano from 1844 to 1909.

Years	Quantity	Value
	Tons	£
1844-1902.	161 118	378 117
1903.	10 957	20 060
1904.	2 625	10 005
1905.	31 790	72 676
1906.	4 634	14 127
1907.	7 399	22 554
1908.	857	6 238
1909.	10 522	31 879
Total.	229 902	555 656
Amount of fiscal surplus price.		398 524
	Total	954 180

The guano output of the small islands along the coast of Chile and of Pí-gua, Punta de Lobos, Magellanes, Chipana, etc., during the last three years was as follows :

	tons	£
1908	857	6 188
1909	10 523	31 879
1910	12 483	45 232

The above quantities are consumed in the country, the exportation of guano being at present prohibited.

The output of 1910 is principally from Punta de Lobos and Chipana. The approximate composition of these guanos is :

	Nitrogen	Phosphoric acid (P ₂ O ₅)
	per cent.	per cent.
Punta de Lobos	1.45	25.4
Chipana	5.80	16.5
Average.	3.62	20.95

Guano is sold for agricultural purposes in bags weighing 100 kg. (gross 102 kg.), or 220 lbs. net., and according to the conditions set by the Government, they are paid the following prices based on the Peso equal to 12 $\frac{1}{2}$ c.

Unit of nitrogen (1 kg.)	6 $\frac{1}{4}$ d
" of phosphoric acid P ₂ O ₅	2 $\frac{1}{4}$ d
Dues, etc., per 220 lbs.	3 $\frac{1}{8}$ d
Percentage of profit	2 $\frac{1}{2}$ per cent.

Calculating the price of the guano on the basis of the average content and prices given above, it comes to 4.75 pesos per quintal or 3s 7 $\frac{1}{2}$ d per cwt. (taking the peso at 1s 6d).

1327 - **Use of Chemical Manures in Cyprus.** — ORR, C. W. (Acting High Commissioner — *Cyprus Annual Report for 1912-13, passim*. London, August 1913.

The Department of Agriculture has taken an active interest in the use of artificials in view of the fact that the soil is especially poor in phosphoric acid. The experiments conducted with various manures succeeded admirably, especially in the case of cereals and pulse, with the result that large quantities of artificials were sold, being used for the first time on a commercial scale.

Demonstrations were also given on the best way of keeping farmyard manure.

1328 - **Sponges as a Fertilizer.** — SMITH, J. G. (Bureau of Soils, Dept. of Agriculture, Washington, D. C.) in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 1 p. 850. Easton, Pa., October 1913.

"Loggerhead" sponge is a large sponge of the gulf of Mexico; it grows abundantly on the coasts of southern Florida, and appears to be used with wonderful results as a fertilizer, especially by the citrus fruit grower. From analyses made at the United States Department of Agriculture it appears that the approximate composition of air-dried material is the following: 4 per cent. nitrogen, 0.75 per cent. each of potash (K₂O) and phosphoric acid (P₂O₅), 5 per cent. of lime (CaO and MgO, mainly the former) and 4 per cent. organic matter. It is probable that other non-commercial species of sponges have a similar composition. If so, and from their demonstrated efficiency as a fertilizer, they deserve to be seriously considered as such wherever they are of easy access.

With a view to determining the feasibility of extending their use, further investigations are in progress.

1329 - **Effect of Certain Artificial Manures on the Bushel Weight of Oats.** — Department of Agriculture and Technical Instruction for Ireland, *Journal*. Year X, No. 4, pp. 705-707. Dublin, July 1913.

The main effects of the application of artificials are shown in (a) the crop yield and (b) the quality of the produce. On the former a great deal of experimental work has been carried out, while the latter has not been exhaustively investigated.

No. of Plot	Manure applied per acre	Average bushel weight
SERIES I, 1909-11 (35 centres).		
1	No manure	36 $\frac{3}{4}$
2	1 cwt. sulphate of ammonia	37 $\frac{1}{2}$
3	3 " superphosphate	37 $\frac{1}{2}$
4	1 " sulphate of ammonia	37 $\frac{1}{2}$
	3 " superphosphate	
5	1 " sulphate of ammonia	38
	3 " superphosphate	
	3 " kainit	37 $\frac{1}{2}$
6	5 " of same mixture as applied to Plot 5	
SERIES II, 1909-12 (48 centres).		
1	No. manure	37
2	1 cwt. sulphate of ammonia	37 $\frac{1}{2}$
	2 " superphosphate	
	2 " kainit	37 $\frac{1}{2}$
	1 " sulphate of ammonia	
	3 " superphosphate	37 $\frac{3}{4}$
	2 " kainit	
	1 " sulphate of ammonia	37 $\frac{3}{4}$
	4 " superphosphate	
	2 " kainit	37 $\frac{3}{4}$
	1 " sulphate of ammonia	
	3 " superphosphate	37 $\frac{3}{4}$
	3 " kainit	
	1 " sulphate of ammonia	37 $\frac{1}{4}$
	3 " superphosphate	
	3 " kainit	
SERIES III, 1910-12 (11 centres).		
1	1 cwt. sulphate of ammonia	37 $\frac{1}{2}$
	3 " superphosphate	
	3 " kainit	37
	1 " calcium cyanamide	
2	3 " superphosphate	37
	3 " kainit	
3	1 $\frac{1}{2}$ cwt. nitrate of lime	37
	3 " superphosphate	
	3 " kainit	36 $\frac{1}{2}$
	1 $\frac{1}{2}$ " nitrate of soda	
4	3 " superphosphate	
	3 " kainit	
Average for 1910 and 1911 only (16 centres).		

In the practical manurial experiments with oats conducted by the Department of Agriculture for Ireland, the grain from the various plots was threshed separately, and it was decided to test the bushel weight of sample of the produce from each plot.

These tests have been carried out each season for the past four years. The bushel weights were determined by means of a chondrometer or conical balance, the average of two weighings being taken for each sample.

The average results are shown in the following tables :

The results of these tests may be summarized as follows :

I. — In no instance is the difference between the bushel weights of the grain from any two of the plots very great.

II. — In all three series of experiments grain of the highest bushel weight has been obtained from the plots manured with the Department Standard Mixture, viz.

1 cwt. sulphate of ammonia	} per acre.
3 " superphosphate	
3 " kainit	

III. — There was very little difference between the bushel weights of the samples of grain from the plots manured with complete mixtures containing varying quantities of superphosphate and kainit.

IV. — The poorest quality grain was obtained from the unmanured plots and that dressed with sulphate of ammonia alone.

V. — Of the four nitrogenous manures, nitrate of soda has produced the lightest grain each season. The results from calcium cyanamide, nitrate of lime were identical.

The results of the field manurial experiments with the oat crop have already shown that the above-mentioned mixtures of artificials produced a profitable increase in yield, and these bushel tests prove that these manure dressings distinctly improve the quality of the grain.

1330 - The Substances classed as Nitrogen-free Extract in Feeding-Stuffs for Human Foods. — KÖNIG, J. in *Zeitschrift für Untersuchung der Nahrungs-Genussmittel*, Vol. 26, Part 6, pp. 273-281 + fig. Münster i. W., September 15, 1901

The bodies collectively known in analyses as nitrogen-free extract form a group hitherto not well defined; as carbohydrates and organic acids they are found in all vegetable food stuffs. This group is usually determined not directly but by difference. It is evident that this method of determination is inaccurate in as much as it bears the errors of the determination of the other five components. The name itself of the group is not very felicitous, for it gives an idea of solubility in water. If it exists it is true in a small number of these bodies such as sugar, dextrin, while many of them that are found in pulse, mushrooms, sugar-coffee, tea, etc., have more resemblance, as parts of the cell membrane, to crude fibre than to the soluble carbohydrates.

Nevertheless, of late years, much progress has been made in the knowledge concerning these bodies. As has already been stated, very different organic substances belong to this group. A notable number of them (such

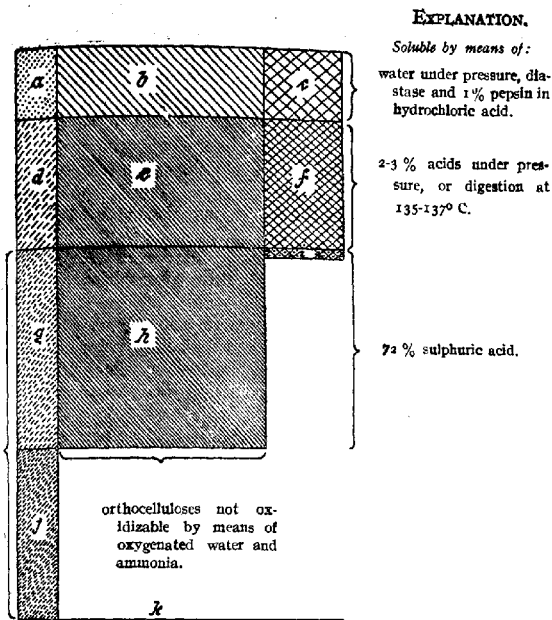


FIG. 1.

- | | | |
|--------------------|--------------------------------|--------------------------------|
| • protolignins. | • = hemicelluloses. | f = orthopentosans. |
| • protocelluloses. | • = hemipentosans. | f = ortholignins (coloured). |
| • protopentosans. | • = ortholignins (uncoloured). | h = cutin, not hydrolyzable or |
| • hemilignins. | h = orthocelluloses. | oxidizable. |

trins, starch and inulin, that is the mono-, di-, tri-, and poly-saccharides, and the organic acids: formic, acetic, butyric, valerianic, oxalic, glycolic, lonic, fumaric, lactic, succinic, malic, tartaric, citric, etc.) are well known and of relatively easy and accurate determination. Still more, in products, such as cereals, flours, tubers and roots (potatoes, beets) and fruit, the nitrogen-free extract bodies are predominatingly starch (inulins, sugars, dextrin and some organic acids, so that the whole group may be justly considered as "carbohydrates". Another group which is less known, but in some cases sufficiently so for methods of determination to be recognized, consists of pectic, tannic, bitter, colouring and other substances. Lastly, there remain those bodies which form a more or less abundant residue in foods and fodders rich in cell membranes, which up to 20 or 30

years ago were hardly capable of definition. The discovery of pentosans by Kiliani and Tollens, of hemicelluloses by E. Schulze and the research of several writers on crude fibre, now allow of a fairly clear idea being formed of this not easily soluble group of extracts, which contribute to form cell membranes.

Among these substances four sub-groups are to be distinguished namely pentosans, hexosans or cellulose, lignin and cutin, of which the first three are found in various degrees of solubility or condensation in foods and fodders.

The distribution of these substances may be represented as shown by fig. 1.

1. — Substances which, like starch, or dextrins and gums, are already soluble in water at a pressure of two or three atmospheres; they may be designated by the prefix "proto".

2. — Substances soluble in dilute mineral acids (about 2 to 3 per cent at the pressure of 2 to 3 atmospheres, or at the boiling point of the solvent) they may be designated like the hemicelluloses by the prefix "hemi" to them belong almost all pentosans and among the hexosans the galactans and mannans.

3. — The hexosans and lignins soluble in cold 72 per cent. sulphuric acid or in 1 per cent. hydrochloric acid for 10 hours at 7 atmospheres; as in this manner the true celluloses can be dissolved, such substances may be designated by the prefix "ortho".

4. — After the preceding treatment of cell membranes, a brown-black mass of cutin and part of the lignin remains; on treating with hydrogen peroxide and ammonia the remaining lignin may be oxidized; this may be called "ortho-lignin (coloured)", to be distinguished from that which was dissolved by the preceding treatment (No. 2) which is "ortho-lignin (colourless)".

5. — Cutin or cutins, including suberins, are not soluble in 72 per cent. sulphuric acid, in cupro-ammoniacal solution, or in hydrochloric acid solution of zinc chloride, nor are they oxidizable by hydrogen peroxide or ammonia and this in consequence of their waxy nature.

These groups of substances are found more or less together in vegetable matter, penetrating into or superimposed upon each other in variable proportions. As in the development of plants pentosans and lignins, and apparently cutins also, compared with the hexosans, increase much more than the celluloses, it is to be supposed that the first product of the cell membrane is constituted by hexosans, on which and in which pentosans and lignins go on depositing; the latter must be formed from the hexosans or from the pentosans by deposition of methoxylic and acetyl groups. As, when the ortho-celluloses are removed from wood, straw, bran, etc., both lignin and cutin preserve the structure of all membranes, the conclusion to be drawn is that these substances are mixed mechanically and not chemically.

In conclusion, the writer, while pointing out that the transitions among the above groups in their several degrees of solubility are not sharply defined

though the degree of solubility keeps constant, expresses the opinion for the determination of the individual groups an international method will have to be adopted so as to have at least comparable results. In an appendix some examples are quoted to show how important to throw light on the behaviour of the elements forming the cell membranes in the production of food stuffs.

- The Enzymes of the Tobacco Plant. — OOSTHUIZEN, J. DU P. and SREDD, D. M. (Agricultural Experiment Station, Lexington, Ky.) in *The Journal of the American Chemical Society*, Vol. XXXV, No. 9, pp. 1289-1309. Easton, Pa., September 1913.

Many chemical changes take place in the tobacco plant throughout its growth as well as during the curing and fermentation periods. New chemical substances are formed and other are decomposed. The final result of these changes gives the colour, texture and aroma to the finished product. A change in these transformations is sufficient to destroy the value of the crop. Several authorities have attributed the curing process to bacterial agencies. If this were so, it would be possible to produce any desired brand of tobacco simply by inoculation. Recently, however, Lœw has shown that these changes are not caused by bacteria but are due to soluble fermenters or enzymes, which are produced in the plant during its development; he has shown the presence of diastase, oxidases, peroxidases, proteolytic enzymes and cellulose-dissolving enzymes. According to him, the fermentative changes in the tobacco leaf are caused by two oxydising enzymes which take oxygen from the air and effect the decomposition of the various components of the leaves with the formation of new products. These enzymes are of the nature of proteins, and are present in the protoplasm of the cells. Under favourable conditions they are set free in the leaf tissues and effect the above-mentioned changes. They are easily destroyed by excessive heat and too rapid drying.

The writer has studied these enzymes in two typical tobaccos in Kentucky, viz.: the White Burley variety and the dark type Yellow Prior. He did experiments with the seeds, green leaves in different stages of development, cured leaves, and with a sample of soil. The seed and leaves showed in every case the presence of appreciable quantities of invertase, diastase, maltase and reductase, in many cases inulase and a proteolytic enzyme were also found. Soil, on the other hand, contained no enzymes except in a few cases. Oxidases appears to be present in the tobacco leaf at all stages of its growth and gradually increase in amount from the seedling stage to the topping stage, after which they gradually decrease until, in the mature leaf they practically disappear.

During the curing and fermentation periods there is a great loss in weight, as much as 15 per cent., about $\frac{1}{4}$ of which is solid matter. In the curing process gases are developed, amongst which ammonia is easily detected. Practically all the starch disappears during the early part of the process and sugar is formed as a new product. This shows the important part played by diastase. The sugars also disappear, being probably destroyed by oxidases. The presence of invertase leads to the conclusion that cane

sugar may be stored in the root and afterwards translocated to the leaves. The protein content of the leaves decreases considerably during the ripening of the plant, also during the curing and fermentation period. The presence of amino-compounds during these processes is further proof of proteolytic enzymes. The nitrates also decrease and the nicotine content diminishes, suggests the presence of reductase and probably there are enzymes also on the resins and gums. It is believed that the aroma of tobacco is produced due to the decomposition products of gums and resins, as well as to the breaking up of glucosides. Positive tests have been obtained for a glucose-splitting ferment. The presence of fats and proteins results in the loss of inferior flavour. They are removed by lipolytic and proteolytic enzymes provided the conditions are favourable.

The characteristic brown colour which develops during fermentation is attributed to the action of oxidases. During the smoking process it has been shown that an ethereal oil is formed from certain products and probably contributes to the flavour. Citric, malic and oxalic acids are found in greater quantities in the cured leaf than in the green leaf. They are probably transformed to acetic and butyric acids during fermentation. Thus we see that numerous complex chemical changes take place during the growth, curing and fermentation of tobacco and that enzymes play a very important part in these changes. For the product to obtain its greatest commercial value, extreme care and attention is necessary at a critical stage of maturity and also during the curing and fermentation.

1332 - **Statistical Study of Wheat Cultivation and Trade, 1881-1910.** — By J. F. (Paper read before the Royal Geographical Society) in *The Geographical Magazine*, Vol. XLII, Nos. 2 and 3, pp. 165-181 and 254-276. London, August and September 1913.

The above paper presents in a convenient form all the available statistics relating to the quantities of wheat produced, imported or exported and consumed in the various countries, during the thirty years 1881-1910; the direction of certain movements and developments of which the present conditions are but a passing stage are followed and discussed, the present period being divided up into three ten-year periods, the statistics for each of which are given separately.

The data have been taken as far as possible from the original returns of the various countries, and the rest from periodical returns compiled by one government from those of other countries and from a few other sources. In collating the various sources of information, the writer sifted and weighed the returns and estimates; he indicates the relative value of the final statistics published in the paper by the use of different kinds of type; one type is used for statistics in which the margin of error is thought to be small, e. g. those based entirely or almost entirely upon actual official returns whose accuracy has not been challenged; figures in italic type are used where there is an appreciable margin of error due either to the incompleteness or uncertainty of the returns or estimates; figures in italic enclosed in brackets are employed for mere estimates upon which no definite conclusions can be based; such estimates stand alone, definite conclusions can seldom be based; such estimates

the production of single countries are useful mainly in calculating production of the whole world, for in that case their errors are small in relation to the total amount, and are likely to cancel one another. The notation has been adhered to in the accompanying table which summarises the principal figures.

In the *United Kingdom* the area under wheat has decreased 37 per cent. during the whole period, while the yield per acre has increased from 28 to 32 bushels, owing partly to the withdrawal of the poorer wheat lands from cultivation and partly to improved seed and methods of cultivation. Imports have risen to supply the requirements of the population, the consumption per head remaining practically stationary. The relative proportion which imports bear to the total consumption has risen from 67 to 70 per cent. and there is every indication that this rise will be maintained in the future. With regard to the sources of the imports, Table I illustrates changes that have taken place during the period.

TABLE I. — *Percentage of total imports into the United Kingdom from each of the Chief Sources of Supply.*

Period	Russia	Romania	Austria-Hungary	India	Canada	United States	Australia	Argentina
1-1890	15	1	3	12	4	51	4	1
1-1900	12	1	2	7	7	56	2	8
1-1910	14	1	0	13	12	32	7	16

It is seen that the supplies from the Southern Hemisphere rose from 5 to 10 and then to 23 per cent. of the total imports. This fact is important so far as it has a steadying influence on the home markets by counteracting in part the effect of bad harvests in the Northern Hemisphere and by bringing corn to the markets at a different season of the year. Figures are given to show that the percentage of flour in the imports has decreased from 29 to 19 during the last decade, which is probably correlated with the increase of the supply from the United States.

France too has reduced her wheat area, but has so raised her yield per acre by improved agricultural methods that her total production is now greater than it was before. The country is almost self supporting, and the consumption per head, though slightly decreased, remains one of the highest in Europe.

In *Germany* the wheat area has been small in comparison with that of France and practically constant throughout the whole period, but the yield per acre has risen in the most remarkable manner from 22 to 29 bushels. The increase in the population and the gradual substitution of

wheat for rye in the national diet have been met by a large increase in imports which is not likely to diminish with time.

In *Austria-Hungary*, the wheat area has increased, and this increase took place almost entirely in Hungary, where three-quarters of the wheat area is situated. Austria now absorbs all the surplus grain produced in Hungary and even that does not quite satisfy the demands of the growing population, whose consumption per head is rising at the same time.

The statistics for the *Russian Empire* in the early period are very reliable, but undoubtedly the acreage, yield and exports have greatly increased both in Europe and in Asia and are liable to further development. The total production at present is second only to that of the United States and if the present rate of increase be maintained will occupy the first place in the next decade; but the proportion available for export is likely to decrease with the growth of the population and the rise of the consumption per head.

Norway and *Sweden* cultivate very little wheat and make small though growing demands on the world's markets, while *Spain* and *Portugal* practically self supporting and show no signs of development. *Italy* shows an increase in all the conditions, as does *Roumania*, which is the only country in the Balkan peninsula which supplies reliable figures.

The uncertainty of some of the *Belgian* figures is due to the fact that previous to 1900 the area was only reported decennially and the product of the successive years was given not as an absolute amount, but as a rate of yield upon the area last reported. The country is becoming more and more dependent on foreign supplies, as are also *Holland*, *Switzerland* and *Denmark*. All these countries, with the exception of *Switzerland* where data are lacking, show high yields per acre.

In *India* the figures indicate no great changes in the past nor likely in the future, but according to the opinions expressed by several authorities when the paper was read, considerable future development may be expected from her as a wheat-producing country.

Japan has increased her area and especially her yield, but is not able to meet her home demands and now imports a quarter of the quantity consumed, and this in spite of the fact that wheat plays but a minor part as a food-stuff in this country. There is no statistical indication of any marked development of the *Chinese* as wheat-eating people.

In the *United States* the official figures collected and issued by the Department of Agriculture have been corrected and made to agree with those of the Census Bureau. Whilst the area and yield have both increased, exports have decreased, and unless large additional developments occur in the semi-arid region the country will before long require all its production to satisfy home demands. During the period under consideration the extension of the wheat area occurred entirely in the West Central States, where the increased yield was manifest in all parts, but especially in the older and more settled portions of the country.

Canada shows a remarkable development as a wheat-producing country. The new wheat areas here, as in the United States, are confined to

est central provinces (Alberta, Saskatchewan and Manitoba), where a further considerable area suitable to the crop is still undeveloped (1), so that the country should eventually attain a production equal to that of the United States. The very high consumption per head indicated during the last decade is probably due to the fact that much of the crop is fed to cattle.

The figures for the *Argentine Republic* point to very rapid development which appears likely to be continued.

Algeria has increased her production by raising her yield and has increased her consumption per head and her exports, practically all of which go to France. *Egypt* has greatly increased her yield, but no longer satisfies the demands, while the *Union of South Africa*, though producing very little at present, in view of the climatic conditions and the possibility of applying dry-farming methods to the Veldt, seems likely to extend considerably its wheat cultivation.

The developments in *Australia* are less important than those in Canada and the yields are extremely low, but both area and yield increased in the last decade and allowed a substantial margin of production for export. *New Zealand*, which at no time had a large wheat area, is apparently still further reducing it in favour of pastoral work. The yield per acre is high and the consumption per head is remarkably so, the latter being probably partly explained by the fact that the production in New Zealand is liable to violent fluctuations: a world shortage in wheat has been reflected by a great outburst of production in New Zealand; following this, when prices have fallen, the produce has been unsaleable and much of it rotted on the ground.

Taking the world as a whole there was an increase of about 300 million bushels (about 14 per cent.) from the first to the second period, but from the second to the third period there was an increase of nearly 700 million bushels (about 25 per cent.). This great increase was due mainly to an increased acreage, but to some extent (about 8 per cent.) to an increased average yield per acre, for while in the first two periods this was 12 bushels, in the third period it rose to 13 bushels per acre.

In each period Europe has produced more than half the total crop, North America has come next, and Asia has been third. The other continents have produced a much smaller amount: South America has increased its importance because of Argentina, and Africa and Australia each produce the same small quantity.

The examination already made of the conditions in the separate countries has led to the conclusion that the acreage may be considerably extended, and a comparison of the yields per acre suggests that in many cases a higher yield may be expected. Thus, as the United States already has an average of 14 bushels per acre, there seems no reason why with improved methods of cultivation and greater care of the soil, at least as high a return

1) See No. 1168, B Aug. 1912.

(Ed.)

	Area Sown Million acres			Total Production Million bushels (a)	
	1881-90	1891-1900	1901-10	1881-90	1891-1900
United Kingdom	2.7	2.0	1.7	76	60
France	17.2	17.1	16.2	301	305
German Empire	4.7	4.9	4.6	104	125
Austria-Hungary	9.5	10.9	11.9	161	186
Russia-in-Europe	30.2	36.2	47.4	244	300
Scandinavia	(0.2)	0.2	0.2	4	5
Iberian Peninsula	(9.7)	(9.8)	10.0	(107)	(99)
Italian Peninsula	(11.3)	11.3	12.2	118	123
Balkan Peninsula	(6.0)	(5.8)	(6.0)	(76)	(74)
Roumania	(3.4)	3.7	4.4	(44)	52
Belgium	0.6	0.5	0.4	18	16
Holland	0.2	0.2	0.1	6	5
Switzerland	(0.1)	(0.1)	(0.1)	3	4
Denmark	(0.1)	(0.1)	(0.1)	4	4
Europe	(95.9)	(102.8)	115.3	(1264)	1358
Russia-in-Asia	(8.4)	10.6	14.3	(74)	100
India	26.7	25.2	26.0	259	243
Japan	1.0	1.1	1.2	13	19
Persia	(2.2)	(1.9)	(1.6)	(22)	(19)
Turkey-in-Asia	(4.5)	(4.5)	(3.5)	(45)	(45)
Asia	(42.8)	(43.3)	46.6	(413)	(426)
Dominion of Canada	2.3	3.1	5.9	38	55
United States	37.1	43.1	47.4	427	559
Mexico	(1.2)	(1.2)	(1.0)	(12)	12
North America	40.6	47.4	54.3	477	626
Argentina	2.0	5.7	12.0	24	65
Chile	(0.9)	(1.0)	1.1	(12)	14
Uruguay	(0.4)	0.6	0.7	(4)	6
South America	(3.3)	7.3	13.8	(40)	85
Algeria	(3.1)	3.2	3.3	(21)	24
Tunis	(0.8)	1.0	1.1	(5)	6
Egypt	(1.2)	(1.3)	1.3	(12)	(13)
Union of South Africa	(0.2)	(0.3)	0.5	(2)	(2)
Africa	(5.3)	(5.8)	6.2	(40)	45
Australia	3.2	4.1	5.7	27	38
New Zealand	0.3	0.3	0.2	8	1
Australasia	3.5	4.4	5.9	35	39
World	192	211	242	2269	2577

(1) 1 bushel = 60 lbs. of grains. — (2) 72 bushels of flour are assumed to be milled from 100 lbs.

CEREAL AND PULSE CROPS

1861

M. Bushels per acre		Net imports or exports, wheat + flour (2) Million bushels			Consumption per head of population. Bushels		
1891-1900	1901-10	1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10
30	32	Im. 144	Im. 177	Im. 209	6.0	5.9	6.0
18	20	Im. 39	Im. 36	Im. 10	8.2	8.1	7.8
25	29	Im. 18	Im. 41	Im. 70	2.3	2.9	3.1
17	18	Ex. 11	Ex. 1	Im. 3	3.5	3.9	4.2
8	10	Ex. 87 (2)	Ex. 104	Ex. 142	(1.5)	1.7	2.4
24	27	Im. 4	Im. 7.2	Im. 11	1.6	1.8	2.2
(20)	13	Im. 9	Im. 10	Im. 12	(4.5)	(4.1)	5.3
11	13	Im. 23	Im. 22	Im. 38	4.3	4.1	5.5
(13)	(13)	—	—	Ex. (2)	—	—	(4.6)
14	17	Ex. 21	Ex. 27	Ex. 42	(3.4)	3.5	3.7
33	35	Im. 21	Im. 34	Im. 46	6.4	7.5	8.1
28	33	Im. 11	Im. 15	Im. 20	4.0	4.2	4.5
(31)	(33)	Im. 12	Im. 15	Im. 17	5.2	5.9	5.1
(30)	(35)	0	Im. 2	Im. 4	2.0	2.6	3.0
(13)	(14)	—	—	—	—	—	—
9	11	—	—	—	—	—	—
10	11	Ex. 33	Ex. 23	Ex. 27	0.7	0.6	0.7
17	17	Im. 0	Im. 1	Im. 5	0.3	0.4	0.5
(10)	(10)	—	—	—	—	—	(1 to 2)
(10)	(10)	—	—	Ex. (3) in good years	—	—	(2)
(10)	11	—	—	—	—	—	—
18	19	Ex. 2	Ex. 13	Ex. 42	7.2	7.3	9.4
13	14	Ex. 116	Ex. 178	Ex. 125	4.5	4.6	5.6
(10)	(10)	—	—	Im. (1)	—	—	(1)
14	15	—	—	—	—	—	—
11	11	Ex. 4	Ex. 37	Ex. 84	6.0	5.4	6.5
(14)	14	Ex. 4	Ex. 4	Ex. 2	(2.8)	3.2	3.7
10	10	Ex. 0	Ex. 2	Ex. 1	(5)	4	5
12	11	—	—	—	—	—	—
8	10	—	Ex. 2	Ex. 4	—	4.0	4.8
6	6	—	—	Ex. (1)	—	—	—
(10)	(15)	Im. 0	Im. 1	Im. 6	(1.3)	(1.3)	(2.2)
(8)	6	—	—	Im. 8	—	—	2
(8)	10	—	—	—	—	—	—
7	10	Ex. 6	Ex. 6	Ex. 28	5.7	5.1	4.9
25	31	Ex. 3	Ex. 1	Ex. 1	9.5	8.7	7.1
8	11	—	—	—	—	—	—
12	13	—	—	—	—	—	—

Net and consumption per head figures apply to the whole Russian Empire.

may not be obtained in European Russia, where the average is 10 bushels. As the present acreage is the same as that of the U. States, the yield would also be the same, namely 650 million bushels, an increase of 190 million bushels.

1333 - **Comparative Experiments on Wheat Selection in Hungary.** — LEIDEN, CH. DE BARS in *Köztudok*, Year 23, No. 79, pp. 2691-2692. Budapest, October 11.

During 1912-13 the writer has conducted comparative experiments with four élite strains of pedigree Hungarian wheat, obtained from M. Kács' selections at Árpádhalm (1). The experimental field, on a loamy soil, was prepared very carefully and put under the following crops: summer crops, chervil, spinach and corn salad. The soil was then disked and mixed with 8 tons 7 cwt. of farmyard manure and 155 lbs. of superphosphate per acre. The seed was sown on the 12th of October; germination was good, but the young plants got a check in winter, so that a dressing of 150 lbs. of sulphate of ammonia was given. The earliest to ripen was No. 16 (July 15); then followed No. 17 (July 17), while No. 219 was the latest (July 21).

The returns at harvest are indicated in Table I.

TABLE I.

No. of strain	Yield of grain per acre	1st class grain	Increase above unselected wheat
	lbs.	%	lbs.
16	2023	59.4	664
17	2004	75.9	645
219	2524	55.6	1165
226	2598	70.5	1239
Unselected sample	1359	73.5	—

Dr. Kosutány, director of the Royal Hungarian Institute of Chemistry, carried out analyses of which the results are shown in Table II.

Dr. Kosutány remarks that the proportionate increase in the weight of the samples is surprisingly small. This he attributes to the abnormal season, which also accounts for the low protein content. The formation of starch continues much longer during a cold wet season than during a normal dry harvest. Analysis also shows that the samples contain

(1) See No. 353, B. April 1913.

TABLE II.
Chemical and physical analysis of samples of selected wheat.

Strain	No. 226	No. 16	No. 219	No. 17
wt per bushel lbs.	61.4	62.3	63.3	62.4
wt of 1000 grains gms.	46.5	39.2	40.3	42.0
size of 1000 grains cc.	37.4	28.7	30.0	31.1
ture. %	14.94	14.60	14.78	14.97
„ „	1.47	1.71	1.42	1.73
筋 (N X 6.25) „	12.06	10.93	11.06	10.81
gen „	1.93	1.75	1.77	1.73
„ „	1.87	1.74	1.89	1.93
le fibre „	3.83	3.79	3.24	3.69
en, moist „	38.95	31.90	42.45	34.30
en, dry „	11.69	9.80	12.70	10.68
ity of gluten „	weak, lacking in cohesion.			

len and more moisture (15 per cent.) than is usual in Hungarian wheats (only up to 12 per cent.).

These experiments show the value of seed selection in improving the yield of wheat even in unfavourable seasons.

- Seeds and Flour of *Dolichos multiflorus*. — *Renseignements de l'Office International*, No. 9, pp. 510-512. Brussels, September 1913.

The velvet bean (*Dolichos multiflorus*, = *Mucuna pruriens*) is cultivated at Bala (Belgian Congo) as green manure. The following analyses show the nutritive value of its seeds.

	Seeds	Flour
pre	13.23	18.30
matter	2.95	0.18
„	5.12	0.09
„	4.04	0.43
„	4.71	traces
nitrogenous matter	23.70	0.42
fat-free extract	41.20	80.58
examined	5.05	(by difference)
	100.00	100.00

1864 FORAGE CROPS. — MEADOWS AND PASTURES, - FIBRE CROP

The seeds have a food value equal to that of peas and lentils and better than that of *D. Lablab* (hyacinth bean).

	Total food values
<i>D. multiflorus</i>	219
<i>D. Lablab</i>	185
Lentils	218

The starch of *D. multiflorus*, produced by primitive methods, is equal to that of potatoes. If manufactured on a commercial basis the waste can be considerably reduced.

1335 - Sorghum Growing in the Victorian Mallee for Summer and Autumn Sheep Feed. — *The Pastoral Review*, Vol. 23, Part 7, p. 673. Melbourne, July 1913.

This is a communication of the results of an investigation on the possibility of growing *Sorghum saccharatum* as summer and autumn feed for sheep in the State of Victoria. Two paddocks, together 270 acres in extent, were sown to sorghum during September and October of last year, and fed with sheep during six months beginning on November 22, after which they were sown to wheat. The flock consisted of an average of 563 head of sheep. In addition to these two sorghum paddocks, two adjoining grass paddocks, very bare of pasture, of about 100 acres each, were available for the sheep while the sorghum paddocks were being "rested" during the test. When the sheep were turned out to graze they were in low condition; at the end of the test they were quite fat.

The results figure out as follows:

Profit on 563 sheep grazed as above at 5s per head.	£ 140 15
Deduct cost of sorghum seed, manure and drilling (£40 10s) and grazing value of bare grass land (at most £30)	70 10
Leaving net profit on 270 acres of sorghum	£ 70 5
say 5s 3d per acre.	

The result may be considered satisfactory, all the more so as the flock might have been by a couple of hundred head more numerous, besides which an average of 10 head horses and cattle were frequently grazing with the sheep.

1336 - Report on Irrigation Experiments with Cotton at Richard-Tell (Seymour) (1912-13). — LEBERT, A. in *Bulletin de l'Association Colonnière Coloniale*, No. 58, pp. 469-486. Paris, September 1913.

The area devoted to cotton experiments was limited by the number of available pumps and extended over 35 acres. The soil when dry was as hard as cement and contained crevices up to 20 inches deep and 1 1/2 inches wide. In such a soil it is necessary to sow from 15 to 20 seeds in each hole. When irrigated, the soil loses its consistency, and the plants loaded with capsules, become top-heavy and require earthing up after

igation. Towards the end of March irrigation had to cease as the water came salt. Nevertheless the yield was distinctly better than in previous years; 900 lbs. per acre were obtained, representing 300 lbs. of fibre. Had not been for the brackish water, the writer estimates that the yield could have been, a third greater. All the crop was of the same quality, fact of considerable importance in determining its commercial value.

Cost of production.

	Cost per acre		
	£	s	d
Ploughing		13	0
Harrowing		1	10
Manuring	1	11	0
Clearing		1	4
Sowing		7	0
Singling, hoeing, topping		15	1
Irrigation {	Hand labour	18	10
	Petrol and oil	19	3
	Canals	2	9
Earthing-up		15	0
Harvesting	1	1	2
Maintenance of animals		17	10
Total	£8	4	1

The cost of production will be reduced as follows :

- 1) More efficient methods of cultivation.
- 2) Improvements in the methods of transport and of applying the manures.
- 3) Reduction in the cost of hand-labour at harvest by increasing the yield.

1. - **The Kapok Tree in Togo.** — ULBRICH, E. in *Notizblatt des Königl. botanischen Gartens und Museums zu Dahlem bei Steglitz (Berlin)* sowie der botanischen Zentralstelle für die deutschen Kolonien, Vol. VI, No. 52, pp. 39-65 + plates. Leipzig and Berlin, September 8, 1913.

This bulletin gives the results of an inquiry held in Togo at the instigation of the *Botanische Zentralstelle für die Kolonien*, on the production of kapok.

The writer draws a clear distinction between the two varieties of *Ceiba andra* (L.) Gärtn.

1. Spiny: Bushy habit of growth; branches in horizontal layers; very pronounced spines at base of trunk; leaves dark green, strongly acuminate; fruits dehiscent on the outside; colour of fibres varying from grey to white; seeds round.
2. Spineless: Trees tall and slender; branches almost erect, at 30° to the vertical; leaves scarcely visible; leaves light green, slightly acuminate; fruits larger, falling with dehiscent; fibre white; seeds slightly pyriform.

According to the writer, the spineless variety is a cultivated form of the tree, only met with in the neighbourhood of dwellings and requiring propa-

gation by cuttings to keep true to type. It is also the most suitable for cultivation owing to the absence of spines and obstructive buttresses, and to having larger fruits containing a whiter fibre. As the fruits do not open before falling the kapok is not carried away by the wind or soil by contact with the ground. This variety, however, requires more sun.

Finally the writer gives a list of points which require to be worked out with regard to the forms of *C. pentandra*.

1338 - **The Position of the Cane Sugar Industry during the Last Twenty Years** — PRINSEN GEERLIGS, H. C. in *The International Sugar Journal*, Vol. XV, No. 11, pp. 466-473. London, October 1913.

The abolition of slavery (1834-1886) together with the sugar bounty begun in 1883 to give a stimulus to the sugar beet industry, placed the cane industry in a very bad position until the Brussels convention changed the state of affairs in 1903. Being thus placed on an equal footing, the sugar cane industry increased its capital and was able to improve its machinery and methods of cultivation. Since the middle of the 18th century, the industry had made little progress, but after 1880 certain colonies, notably Java and Hawaii, began to apply certain improvements which had been effected in the beet industry.

The cane industry received a great stimulus from the Spanish-American War, which resulted in the occupation of Porto-Rico and the Philippines by the United States and the pouring of American capital into Cuba. This together with the preferential tariff accorded by the United States to the cane of the Hawaiian Islands, caused a great development of their cane industry. The occupation of Formosa by Japan had a similar effect, as did the establishment of protection in South Africa and Australia. The accompanying table illustrates the changes that have taken place.

Previous to the Brussels convention the quantity of protected sugar cane was hardly one-quarter of the total production and since then it has considerably increased, but with the application of the new American tariff it will amount to only about 12 per cent. of the total production.

Sugar cane is largely consumed where it is produced or in its immediate neighbourhood. The British East Indies consume all the local produce and also the greater part of the production of Mauritius and one-third of the production of Java. The United States consume the production of Cuba, Porto Rico, and several of the other West Indies besides that of Hawaii. China and Japan consume the produce of Formosa and a portion of that of Java and the Philippines. The sugar produced in China, Cochin China, Mexico, the South American Republics, Natal, Australia and Egypt is almost entirely consumed locally. Several of these countries also consume a small proportion of foreign sugar. Formerly Great Britain, the United States and Canada all imported large quantities of sugar from different parts of the globe. Now England alone varies the place of origin of her supply according to the abundance or otherwise of the harvest in the various producing countries.

World's Production of Sugar Cane in thousand tons.

	1900		1912	
	Protected	Unprotected	Protected	Unprotected
British India	—	1 799	—	2 552
Highlands Settlements	—	20	—	6
China	—	50	—	50
Java	—	150	—	60
Philippines	40	—	40	—
Portugal	—	45	117	—
Spain	—	63	175	—
United States	—	744	—	1 331
France	35	—	20	—
Germany	273	—	168	—
Italy	—	75	130	—
Japan	—	283	2 375	—
Mexico	—	52	340	—
Puerto Rico	—	241	—	268
West Indies	—	—	—	—
Central America	25	—	22	—
Colombia	10	—	10	—
Costa Rica	5	—	5	—
Cuba	—	85	—	90
Dominican Republic	—	13	—	13
Haiti	6	—	7	—
San Domingo	118	—	140	—
Trinidad	185	—	204	—
Venezuela	117	—	150	—
Yucatan	—	99	—	58
Zambia	—	—	30	—
Zimbabwe	16	—	97	—
Algeria	—	157	—	207
Belgium	—	43	—	40
France	113	—	130	—
Germany	268	—	480	—
Italy	—	33	—	60
Total	1 211	3 962	4 640	4 735

1339 - **Wood-oil Trees of China and Japan.** - WILSON, B. H. in *Bulletin of the Sino-American Botanical Society*, Vol. XI, No. 3, pp. 447-461. London, July-September, 1913.

The increasing demands of Europe and North America for wood-oil from China and Japan has resulted in considerable increases in the production and production. The cultivation of these oil-producing trees (*Aleurites* sp.) is recommended to Agricultural Departments for experiment in the warm-temperate rocky regions of the colonies. Their culture requirements are of the simplest, growth is rapid and the trees commence to bear fruit in four or five years after the seed is sown. They fruit freely and are apparently indifferent to the nature of the soil.

Chinese species. — 1. *Aleurites montana* Wils. (or Mu-yu-shu).

This species originated in the South-East of China and is still cultivated there. It requires a subtropical climate and abundant rainfall. The male inflorescence is a many-flowered much branched corymb and the female inflorescence a few flowered raceme borne on the same tree. The fruit egg-shaped-5 to 6 cm. long, 4 to 4.5 cm. wide, pointed at the summit and flattened at the base, with three longitudinal and many transverse much raised ridges; the interior part of the fruit (mesocarp) is thick and woody and encloses three compressed broadly obovoid seeds about 3 cm. long by 2.5 cm. broad and warty on the outside. The yield of oil from this tree is small.

2. *Aleurites Fordii* (or Tung-yu-shu).

This is the most important species, producing nine-tenths of the wood-oil of China. It is recommended for experiment in various parts of the British Empire. The seeds soon lose their power of germination, but dried in the sun for 2 or 3 days and packed in barrels or sacks they retain the germinating power for 3 or 4 months. It occurs in all the warm temperate parts of China, but more, specially within the watershed of the Yangtze river. It is essentially a hill-side tree thriving in the most rocky situations and in the poorest of soils where there is a minimum rainfall of 70 cm. (27 in). It will also withstand drought and a few degrees of frost. The flowers appear in April before the leaves unfold and are borne in numerous terminal and axillary few-flowered, cymose corymbs. The central terminal flower of each cyme is female, the others usually male.

The fruit is apple-like, green to dull brown when ripe, 4 to 5 cm. long and broad, pointed at the summit, narrowed to the foot-stalk and perfectly smooth on the outside. It contains 3 to 5, rarely more, broadly obovoid seeds. Both fruit and seeds are poisonous, causing severe vomiting and purging. The fruit ripens in September and October and is gathered before dehiscence, placed in heaps and covered with grass and straw to effect fermentation. The skin soon decays and the seeds are easily removed. In China this tree is only planted where other cultivation is impossible. For cultivation on a commercial scale the writer recommends planting not more than 20 ft. apart each way.

The process of extraction adopted in China consists in first crushing the seeds in a circular trough beneath a heavy stone wheel. The meal is then roasted in a shallow pan, placed in a wooden vat with a wicker bottom and thoroughly steamed over a cauldron of boiling water. With the oil

an iron ring and straw it is made into circular cakes which are arranged in a large wooden press and the oil is squeezed out of them. The yield is about 40 per cent. by weight of the kernel. Chemical analyses of the kernels gave 58.3 per cent. of oil. The local uses of these oils are numerous. They are the chief paint oils of the country and are largely employed as varnish, as water-proofing material, as ingredients in concrete and in medicine.

Physical Properties of Tung-Oil.

	Chapman	Imperial Institute
Specific gravity	0.942	0.940
Refraction value	194.2	191.8
Iodine value %	170.6	166.7
Refractive index at 20° C	1.5179	—
Viscosity by the Redwood Viscometer at 15.5° C in 2 seconds	1850	—

Thus tung-oil is characterised by 1) a specific gravity higher than that of almost any vegetable oil, except castor and tallow-seed oils, 2) a refractive index higher than any known vegetable oil and 3) a high viscosity. The most characteristic property is the formation of a firm gelatinous mass when heated to a temperature of 250° C. for a short time; this change appears to be due to polymerization and not to the absorption of oxygen. The property of forming a gelatinous mass on heating is the basis of a number of tests. Genuine tung-oil should yield a firm jelly which crumbles readily in the fingers and is not sticky.

Its principal uses in Europe and America are in the preparation of 'driers', which are compounds of the fatty acid of the oil with metals like lead and manganese, and are known as "tungate driers". Processes have also been invented for its use in the manufacture of linoleum, rubber substitutes, waterproof paper, etc., but it is not possible to state to what extent the oil is used for such purposes at the present time.

Japanese species. — *Aleurites cordata* R. Br.

This species is distinguished by its fruit, which is 2.5 cm. long, wider at the base, flattened and often depressed at the summit, slightly tapering to the pedicel, with three slight longitudinal and several irregularly transverse ridges. The oil of this tree has been confused with that of the Chinese species. The specific gravity, iodine value and refractive index are higher than in the Chinese variety, and the Japanese oil will remain liquid under conditions such as suffice to convert the Chinese oil into a hard jelly. The article is illustrated by five plates and a reference index is appended.

1340 - **The Cultivation of Rubber Trees in West Africa** (1). *Funtumia elastica*. CHEVALIER, A. in *Journal d'agriculture tropicale*, Year 13, Nos. 143 and 145, pp. 136 and 197-201. Paris, May and July, 1913.

Funtumia elastica is the only tree indigenous to Africa which yields good quality of rubber. Although it has been cultivated for nearly 30 years we still know very little of its biological peculiarities. The writer summarizes the observations he has made amongst the natives. These are of great importance, and the conclusions to be drawn from them will serve as basis for the constitution of new plantations.

Trees which are allowed to develop surrounded by dense undergrowth have long clean stems and appear more suitable for latex production. On the other hand trees planted in clearings and well-kept plantations develop a thick stunted growth and a short, much-branched trunk. They mature earlier but yield less latex.

The writer reviews the results obtained in the principal colonies where *Funtumia* is cultivated, viz. the Gold Coast, S. Nigeria, the Belgian and French Congo. He then gives some interesting details of the plantation at Bokro (Gaboon). In 1906 some trees were planted 12 ft. by 12 ft., and others 10 ft. by 7 ft. In both cases the development of the trees was normal. At the end of 6 years they reached a height of from 30 ft. to 35 ft. with clean trunks from 15 ft. to 20 ft. in length. The author attributes this fine growth to clove planting, as the soil was of quite average fertility.

In one portion of the plantation the branches were destroyed by fungus disease. With a view to promoting a rapid and straight growth in the new shoots it seemed desirable to allow the natural growth to spring up round the trees, especially that of *Musangas*, which shoots up very rapidly. The half etiolated shoots of *Funtumia* grew up with the *Musangas*, and the latter were not cut down until the new shoot had reached a suitable development.

1341 - **The Cultivation of *Manihot Glaziovii* in the Belgian Congo**. JACQUES, A. in *Bulletin de l'Association des planteurs de Caoutchouc*, Vol. V, No. pp. 223-224. Antwerp, September 1913.

Until recently the culture of *Manihot* has been neglected in the Belgian Congo. In 1911 only two or three small plantations existed, possessing between them some thousands of trees. The writer gives figures showing results obtained in this region with *Manihot Glaziovii*. A tree 5 years old planted in good soil yields an average of 2 lbs. of dry rubber per annum. The yield increases rapidly with the age of the trees until it reaches 5 or 6 lbs at the age of 8 or 9 years. With hand labour it is possible to establish and maintain a plantation of 1000 ha. (2470 acres), containing 1 200 000 trees, until the trees come into bearing with a capital of 2 m. francs (£80 000).

The present price of *Manihot* rubber on the Antwerp market is 10 sh. 9d per lb. In the event of a further decrease in the price of rubber, plantations of 3 and 4 years growth could be left without cultivation for several years until the price recovered.

(1) See No. 637, B. June 1913.

41 - **The Influence of Rainfall on the Quality of Tobacco in Sumatra.** — SCHAEFFER, G. in *L'Agronomie Coloniale*, Year 1, N. 3, pp. 65-67. Paris, 30. September 1913.

The best quality of tobacco leaves are produced when the plant grows rapidly; consequently an abundant and readily available water supply at the right moment is an important factor in the production of high-class tobacco. Dry weather in the early stages of plant growth would cause considerable development of the root system in search of moisture; should this be followed by rains (about a month after planting out) optimum conditions should then obtain for rapid growth. Such favourable conditions prevailed during 1911 at Deli, Sumatra, whilst in 1909 the weather conditions were quite the reverse. The quantity of tobacco harvested at Deli in 1911 was slightly greater than that harvested during 1909, and its quality was considerably better, as shown in the following table:

Years	Rainfall in inches		Price per lb.
	March	April	
1911	5.3	1.8	1s 3d
1909	0.2	9.1	2s 2d

42 - **Tea in Russia.** — JUMELLE, H. in *Journal d'Agriculture tropicale*, Year 13, No. 147, pp. 260-262. Paris, September 1913.

Russia consumes over 140 million pounds of tea per annum. Two thirds of the tea imported from China are in the form of compressed blocks, or briquettes or tablets.

Tablets. — The waste powder in the process of manufacture is sifted, and the fragments of leaves are made into tablets, which are subjected to steam pressure for some time, then wrapped in tin-foil and white paper. These constitute the best quality of compressed tea.

Briquettes. — These are made from the siftings, consisting of stems and leaf stalks. These are pressed into blocks and subjected to a current of steam for 3 minutes. To compensate for the loss of aroma during this process, 5 to 50 per cent. of foreign tea is mixed in. These briquettes are made of both black and green tea. In the latter case, a longer exposure to steam is necessary. They are wrapped up in white paper only.

The tablets weigh approximately $\frac{1}{4}$ lb., and are packed in wooden lead boxes. The briquettes of black tea contain from $\frac{1}{2}$ lb to 3 lbs., and those of green tea are made up in two qualities, the best quality weighing $\frac{1}{2}$ lbs. and the second $3\frac{1}{4}$ lbs. They are packed in bamboo baskets with leaves.

Attempts at tea cultivation have been made in Russia since 1848. It is grown in the Caucasus, especially on the south-east side of the Black Sea where the climate is warm and moist and the soil a fertile red clay. The annual production is about 130 000 lbs. The first picking takes place after four years, and is repeated 3 or 4 times each year. The product does not possess the aroma of well-grown tea, and is used chiefly by the poorer classes, who buy it in the form of briquettes.

1344 - **The Cultivation of Buchu.** — VON WIELLIGH, G. R. in *The Agricultural Journal of the Union of South Africa*, Vol. VI, No. 1, pp. 80-87. Pretoria, July 1913.

The cultivation of buchu has been much neglected in South Africa, and, owing to the wasteful method of rooting up the plants to collect the leaves, it is almost in danger of extermination.

The exports have diminished from 243 742 lbs in 1908 to 223 027 in 1912 and the price of the exported leaf has risen about 500 per cent. The writer carried out experiments with different varieties and obtained the following results:

Varieties. - 1) *Barosma serratifolia* (Kloof Buchu), sometimes known as "fountain buchu" on account of its preference for a damp soil. It grows to a height of 4 feet but may even reach a height of 10 feet, and is found at altitudes varying from 500 to 1000 feet above sea-level.

2) *Barosma betulina* (Mountain Buchu) is the most valuable species. It contains the greatest number of oil glands in its small, light green leaves. It is more compact and dwarf than the above and grows to a height of 3 or 4 feet. It is found at altitudes between 1000 and 2000 feet and is the most abundant species of buchu.

3. *Barosma crenulata* (Large-leaved Buchu), is little known and is not widely distributed.

The soil most suited to this plant is a well-drained sandy loam. It is propagated either by seeds or cuttings. Transplanting takes place during the autumn (March to May) in well cultivated soil, after a heavy rain, and the plants are placed 5 ft. apart each way.

Cultivation. — This consists of weeding and raking the surface between the plants; this must be done very lightly, so as not to damage the roots which run horizontally.

Harvest — The leaves are richest in oil in January and February, but if it is desired to save the seed the crop must be cut later.

Uses. — The leaves are used as a diuretic and stomachic. Badly prepared leaves lose a considerable quantity of their properties, and it is preferable to extract the oil in alcohol or boiling water and market the product in this form. It is often adulterated with *Empleurum serratum*, which is absolutely worthless.

1345 - **The Importance of the Cultivation and Preparation of Medicinal Plants, particularly in Hungary.** — IRK, KÁROLY (Chemist at the Experimental Station for Medicinal Plants at Kolozsvár) in *Közlök*, Year 23, No. 74, pp. 2533-2555. Budapest, September 24, 1913.

Of late years, pharmaceutical literature has been paying increasing attention to the question of culture and preparation of medicinal plants.

TABLE I.
Hungarian Trade in Dried Medicinal Plants, 1911.

Country	Imports to Hungary	Exports from Hungary		
	cwt.	cwt.	£	s
Austria	5 197	17 956	28 512-	10
Bosnia-Herzegovina	417	26	40-	12
Croatia	18	—	—	—
Czechoslovakia	951	18 379	38 379-	5
Denmark	—	218	434-	15
France	126	2 474	3 352-	0
Germany	43	690	1 370-	17
Greece	4	30	56-	5
Ireland	53	190	360-	0
Italy	57	1 290	2 046-	18
Netherlands	—	14	30-	8
Poland	146	199	378-	15
Romania	—	77	195-	0
Russia	2	53	105-	15
Sweden	4	53	135-	0
Switzerland	6	—	—	—
Siam	2	—	—	—
Slovakia	8	—	—	—
Spain	—	22	55-	0
United States	6	—	—	—
Yugoslavia	45	4 302	10 930-	0

from old data published spasmodically and now out of date, TSCHIR-
may be considered the initiator of the rational cultivation of medic-
plants in Europe. His work (1) and that of THOMAS (2) are looked upon in

1) Ueber den Anbau der Arzneigewächse in Deutschland. - *Archiv. der Pharm.*, 1890, 563, Arzneipflanzen. - *Real-Enzyklopädie der Pharm.*, 2. Aufl., etc.

2) Arbeiten des pharmazeutischen Institutes der Universität Berlin.

TABLE II.

		Plants and dried parts of plants used in medicine	Other plants and dried parts of plants; Saponaria roots	Aniseed and coriander	Caraway seed	Pyrethrum powder	Juniper berries
		cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Imports	1911 ..	7 085	7 122	431	8 366	1 470	31 23
	1912 ..	6 451	5 609	—	—	—	—
Exports	1911 ..	46 098	1 254	1 450	457	277	4 75
	1912 ..	39 874	862	—	—	—	—

Germany as the basis of the study on the subject. Next to Germany, Hungary, under the direction of Dr. PATER (1), Director of the Agricultural Academy of Kolozsvár, takes the second place in relation to the study of the subject. Next come MITLACHER in Austria (Korneuburg), SENFT (2) in Bohemia and Dr. VRGOC in Croatia, following Hungary's example.

In Germany, the University of Berlin has set apart an experimental field for this work at Steglitz-Dahlem. In France the Ministry of Agriculture pays particular attention to the cultivation of medicinal plants and publishes the results of experiments, which are carried out on a model scientific basis. In Sweden, the experimental garden at Landskrona receives state assistance. In America the matter is under the control of the Bureau of Plant Industry with a special section of the Department of Agriculture at Washington to deal with Drug Plantations. The University of Minnesota has an experimental field of considerable area under the control of the Pharmaceutical Institute. Following the example of the Experimental Station for Medicinal Plants in Hungary, stations at Korneuburg and Prague in Austria have already been started. All these Stations, furnished with chemical, therapeutic and pharmacological laboratories, are intended for research with a view to determining on the one hand a rational cultivation of medicinal plants, and on the other the working-out of special chemical experiments.

The author outlines the conditions of the cultivation and preparation of medicinal plants in Hungary and furnishes statistics on the commercial movement in dry medicinal plants in 1911 (see Table I, p. 1873).

As may be seen from the statistics given, medicinal plants exported from Hungary find markets chiefly in Germany, France and America.

(1) *Kísérletügyi Közlönyek.*

(2) *Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Oesterreich.*

ies whose great pharmaceutical factories demand considerable importations.

Completing these figures by the commercial value of plants and parts of plants not enumerated above, we obtain the gross amount of Hungary's exports and imports, as shown in Table II.

The exportation of medicinal plants from Hungary is increasing and the quality of the products is also improving. The cultivation of these plants in Hungary on a sound basis and their preparation on a larger scale, when the confidence of other countries has been gained, will consolidate this industry and the industrial branches connected with it.

The Present State of Japanese Horticulture. — Communicated by HIROSHI HARA, Professor of Horticulture in the Faculty of Agriculture, Imperial University of Tokyo, Japan.

The development of horticulture in Japan dates from the introduction of Western civilisation. Since 1875 more especially, fruit trees, vegetables, flowers and ornamental trees have been imported from Europe and America. Similar importations have been received from China. These species and their varieties have been improved and their cultivation extended.

Houses in European or in Euro-Japanese style have increased in number, while in the arrangement of trees, etc., in the new gardens it has been necessary to depart from the traditional arrangement of the Japanese style garden.

For the development of horticulture the Government has established a horticultural Section of the Agricultural Station, which is under the control of the Minister of Agriculture and Commerce, and every provincial agricultural station includes a study of this subject. Besides this, the two Imperial Universities, controlled by the Minister of Public Instruction, possess Faculties of Agriculture which include courses in horticulture.

The area devoted to the culture of fruit trees has extended considerably in the last ten years, and the yield of horticultural products has increased remarkably to meet the growing demand. The amount of produce exported to foreign countries is not yet very great. Its total value rose in 1910 to the sum of 4 673 699 yen (one yen = 2 s approx.). The principal exports are lemons and oranges (746 184 yen), apples (439 518 yen), onions (471 609 yen), potatoes (417 545 yen), lily bulbs (737 888 yen), other plants and bulbs (8 306 yen), preserved fruits and vegetables (310 328 yen).

The fruit trees and culinary plants most generally cultivated are:

Fruit trees: pear, apple, peach, plum, cherry, Japanese apricot (*Prunus Mume*), persimmon (*Diospyros Kaké*), fig, chestnut, vine, tangerine, orange.
Vegetables: Radish, turnip, carrot, burdock (*Lappa edulis*), sweet potato, potato, leek, onion (*Allium fistulosum*), onion, cabbage (*Brassica* sp., *B. chinensis*, etc.), *Brassica canadensis* var. *japonica*, *Aralia cordata*, egg-plant, cucumber, gourd, watermelon, peas, beans, strawberry, etc.

Fruit is generally consumed in a fresh state; cooked fruit is not much appreciated. Certain fruits, such as the persimmon, are eaten either fresh or

dried. The small demand for preserved fruits is probably due to the fact that they do not go well with a rice diet.

The trees are cultivated on the following systems :

- 1) *As bushes* : Apple, pear, plum, cherry, Japanese apricot, persimmon, fig, chestnut, tangerine, orange, etc.
- 2) *In pots* : Peach, plum, Japanese apricot, persimmon, etc.
- 3) *Umbrella-shaped* : Vine, pear, etc.
- 4) *As espaliers* : Vine, etc.

Violent winds are frequent in Japan all through the summer and cause damage to fruit trees. The umbrella-shaped system is the best for resisting these winds, though inconvenient for treating insect and fung diseases. It is, however, on the whole the most suitable for the climate and is generally adopted for certain fruit trees, being most conducive to fruitfulness. For many years fruits have been cultivated under glass especially vines, peaches, melons, etc. The forced culture of vegetables increases from year to year, as also the cultivation of flowers under glass.

Great attention is now being paid to the preparation of dry vegetables and to the preservation and packing of fruit.

The climate of Korea is much drier and sunnier than that of Japan. Fruit trees flourish better and produce a better quality of apples, plums, cherries, grapes, etc. The cultivated surface and the produce are increased annually.

1347 - **European Fruit Trees in Central Madagascar.** — FAUCHÈRE, A. in *Journal d'Agriculture tropicale*, Year 13, No. 147, pp. 257-260. Paris, September 30, 1913.

The central region of Madagascar has a very agreeable climate and where cleared of marshes will be quite suitable for settlement. Consequently attempts have been made to acclimatise European fruit. Unfortunately this process becomes complicated by the fact that the trees commence ripening their fruit towards the end of the winter season during warm damp weather.

The trees vary somewhat in their degree of adaptation. Peaches and apricots fruit abundantly, but plums have not yet given satisfactory results. The apple is almost as successful as the peach, but the pear and chestnut are difficult to acclimatise. Figs are very uncertain in their results, while the raspberry is extensively cultivated. Good varieties of oranges and tangerines are yet very rare. Vines flourish in this climate and one variety, the Malagasy vine ("vigne malgache") is almost immune to attacks of mildew and meets with considerable favour. The quince is well adapted to the climate and the chestnut grows vigorously, but its fruits are destroyed by insects. The persimmon produces large fruits in great abundance.

The station at Nanisana is largely responsible for the introduction of fruit trees, and possesses extensive nurseries where large quantities of grafted specimens are produced each year.

Fruit culture is no longer only of local interest, as the gardeners at the centre have begun to send supplies to all the markets in the island.

18 - **The Composition of Irrigated and Non-irrigated Apples.** — JONES, J. S. and COLVER, C. W., in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 424-428. Cambridge, October 1913.

The writers give the results of analyses of 116 varieties of apples grown with irrigation and of 168 varieties grown without irrigation; the percentage water, total solids, sugars, acids and crude protein was estimated. The differences between the apples from irrigated and non-irrigated trees are small and variable, and where the desiccated apple is the article of commerce, the writers consider that there can be no basis for market discrimination between the fruit from irrigated and non-irrigated trees.

19 - **Three Forest Species of the Annamite Range.** — DURARD, M. and REICHHARDT, PH. in *L'Agronomie coloniale*, Year 1, Nos. 2 and 3, pp. 38-41 and 76-81, plates 3. Paris, August and September, 1913.

The writers describe three forest species well distributed throughout the range and of considerable economic importance, but not previously recorded.

I. *Wrightia annamensis* Eber. et Dub. This is a small tree very common in Annam and Tonking, scarcely exceeding 7 to 8 metres in height, with a trunk of maximum diameter of 15 cm. (6 in.) It is found in deep woods in cool shady situations. It produces a very resistant wood used for making wooden clogs. In structure it resembles boxwood. Considering the ease with which it can be cut and worked, it should be suitable for wood carving.

II. *Symplocos multiflora* Eber. et Dub. This tree has cylindrical branches covered with a reddish bark. The inflorescences are arranged terminally in simple clusters of 40 to 60 cm. in length with separate flowers. The wood is used in Annam as building material.

III. *Symplocos Dung* Eber. et Dub. This tree also has cylindrical branches, at first greenish yellow in colour, later developing a light brown covering of bark. The inflorescences are axillary, consisting of simple few-flowered spikes 6 cm. in length. The wood is used for making plough-shares and harrows.

LIVE STOCK AND BREEDING.

20 - **A New Species of *Crotalaria* Dangerous to Cattle in German East Africa** — BAKER, E. G. in *Notizblatt des Königl. botanischen Gartens und Museums zu Dahlem bei Steglitz (Berlin)*, sowie der botanischer Zentralstelle für die deutschen Kolonien, Vol. VI, No. 52, p. 66. Berlin, September 8, 1913.

The writer describes a poisonous species of *Crotalaria* as *C. Zimmermanni*; it is from German East Africa.

1351 - Investigations on the Rate of Resorption of Proteins and their Decomposition Products in the Small Intestine. — MESSKILL, HERMANN in *Blotchemisches Zeitschrift*, Vol. 54, Parts 5 and 6, pp. 446-473. Berlin, September 2, 1913.

The results of experiments carried out on an eight months old fox-terrier by means of a Thirn Vella fistula are summarized by the writer as follows :

1. The resorbent power of the mucous membrane of the small intestine diminishes with time and with the course of the experiment. The decrease is caused by a disturbed function of the membrane and can go so far that no more protein is taken up.

2. Of the true proteins that were tested it was proved that the serum blood was the one best absorbed, gliadin followed next, then casein and lastly haemoglobin. Casein, contrary to what was observed in Friendländer experiments, was resorbed as quickly as other proteins when the activity of the membrane was normal. The quantity of nitrogen resorbed in 10 minutes averaged 20 milligrams for serum, 16 mgm. for gliadin, 12 mgm. for casein and 8 mgm. for haemoglobin. The rate of resorption of the genuine proteins does not seem to depend upon their degree of concentration.

3. The average quantity of nitrogen resorbed in 10 minutes was 27 mgm. for peptone, 27 mgm. for ereptone, and 22 mgm. for hydrolysed casein. It is therefore probable that in the intestine not all the protein synthesised into indifferent blood albumen, but that a considerable quantity of nutritive nitrogen is resorbed as more complex substances, such as albumose and peptone.

4. Whilst during a first series of experiments it was found that with food poor in nitrogen and those rich in the same element, the rate of resorption of the proteins and protein decomposition products introduced into the fistula did not differ much, a second series of experiments showed a lower degree of resorption for the former kinds of food than for the latter. The lower resorption in the case of a nitrogen-free food is probably due to a disturbance of the physiological function of the intestinal cells caused by the lack of nitrogen.

5. When all the proteins and even the completely separated decomposition products were no longer resorbed by the mucous membrane of the intestine, it was found that the resorption of grape sugar did not differ from that normally observed. It follows that the splitting up of protein does not lead to a power of resorption like that of grape sugar.

1352 - Cyanogenesis under Digestive Conditions. — AULD, S. J. M. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 409-417. Cambridge, October 1913.

Following on his previous work (1) the writer carried out a number of experiments showing the inhibiting power of cellulose on cyanogenesis from linseed cake by incubating 25 gms. of the cake with various fodders which

(1) AULD, S. J. M. The formation of prussic acid from linseed cake and other feeding stuffs: *Journal of the South-Eastern Agricultural College*, Vol. 20 (1912), p. 289; and *Journal of the Board of Agriculture*, Vol. 19 (1912), p. 416; *Id.* The hydrolysis of amygdalin in emulsin: *Journal of the Chemical Society*, Vol. 93 (1908), p. 1251.

been dried and reduced to powder, and also with their aqueous extracts. The action of the extracts was always small and occasionally negative; cyanogenesis was reduced to 90 per cent. of the controls, average of 85; while that of the ground plant was considerable and invariably active (cyanogenesis was reduced to 71 per cent. of the controls, average of 85); in the case of *Heliant*, which is a coarse, bulky fodder, not only aqueous extracts were tried, but also ether and alcohol extracts, and in no case was their inhibiting faculty as great as that of the extracted residue. However cellulose was prepared both from filter paper and from cottonwool and proved equally effective, the action being due to the adsorption of the cyanogenetic enzyme by the cellulose. This part of the work is being further developed along other lines.

The effect of acids and alkalis on cyanogenesis was also estimated by incubating 20 gms. of the cake in acid or alkaline solutions of various strengths for different lengths of time. $\frac{N}{100}$ hydrochloric acid reduced cyanogenesis to 9.7 per cent. of its maximum effect, and even $\frac{N}{500}$ hydrochloric acid produced a slackening in the rate of evolution. The alkali appeared to be less effective than the acid as an inhibitor, but $\frac{N}{100}$ alkali reduced cyanogenesis to 27.5 per cent. of its maximum effect and the writer estimated that $\frac{N}{100}$ alkali (which represents the strength of saliva) would prove completely inhibitive. It is to this alkalinity of the saliva that he attributes the various effects of feeding linseed cake to ruminants, as the food would be within reach of the inhibiting acid of the true stomach for some hours after feeding.

To trace the extent and orientation of cyanogenesis in the animal body, Hampshire-down tegs were fed with linseed cake before being slaughtered, and after they were killed the stomachs were removed and the contents washed into large flasks and analysed for hydrocyanic acid. The results were as shown in the table (p. 1880).

In each case the paunch contents were alkaline to litmus and the two intermediate stomach compartments either neutral or faintly alkaline; in some cases, also, by far the greater part of the meal was still in the rumen. The results show that a certain amount of prussic acid generation will usually take place from cyanogenetic feeding-stuffs when eaten by animals; but the greater part of this formation will take place in the paunch in the case of ruminants, and in the fundus portion of the stomach in other animals. The chief limiting factor would appear to be the alkalinity of the food, assisted secondarily by the cellulose present in the food, and by many of the other food components.

With regard to the conditions of possible poisoning by cyanogenetic feeding-stuffs, the writer remarks that though the nature and alkalinity of the saliva is known to vary considerably, it is doubtful whether the alkalinity will ever fall sufficiently low to allow prussic acid to be evolved in large enough quantity to produce toxic symptoms; he is more inclined to attribute cases of poisoning to the use of feeding-stuffs which

Sheep	Hydrocyanic acid formed, gms.					Percentage of available HCN acting by form.
	Rumen	Reticulum	Omasum	Abomasum	Total	
No. 1. Given 1 lb. of crushed linseed cake 2 hours before killing	0.03056	0.00388	0.00142	0.00077	0.03663	20.1
No. 2. Given 1 lb. of crushed linseed cake and a few handfuls of hay 2 hours before killing	0.02357	0.00311	0.00160	0.00065	0.02893	15.9
No. 3. Given 1 lb. of crushed linseed cake $\frac{1}{2}$ an hour before killing	0.00906	traces	—	—	0.00906	4.9

contain free acids or which may undergo acid fermentation in the animal body, such as fresh grass, ensilage, etc., together with the cyanogenic material. Such acid substances are likely to neutralize the salivary alkalinity and suspend its inhibiting powers. Linseed cake fed with acid food or imperfectly made linseed gruel or immature sorghum, would then become dangerous.

Poisoning from Java beans (*Phaseolus lunatus*) seems to form rather a special case and the circumstances generally are so much against prussic acid formation in the animal body that it appears possible that another and unsuspected poison may be present in the seeds of the varieties *Phaseolus lunatus*.

The small amount of prussic acid formed when cyanogenetic feeding stuffs are used may be actually beneficial to the animals, acting as a hormone and stimulating the physiological functions in the digestive tract, and may be the cause of the undisputed superiority of linseed cake for fattening cattle. The point is being further investigated by the writer.

1353 - A Contribution Towards an Analysis of the Problem of Inbreeding.
PEARL, R. in *The American Naturalist*, Vol. XLVII, No. 562, pp. 577-614. Lancaster, Pa., October 1913.

The writer presents a method for expressing numerically the degree of inbreeding which exists in a particular case by measuring the proportion which the actual number of the ancestors bears to the maximum number possible in that case. The unit of comparison is called the *Coefficient of Inbreeding*, and is written Z ; then if

p_{n+1} = possible number of different individuals in the $n+1$ generation
and q_{n+1} = actual " " " " "

$$Z_n = \frac{100 (p_{n+1} - q_{n+1})}{p_{n+1}}$$

Z rises from 0 to 100 with the degree of inbreeding, and if the value for successive generations in the ancestral series be plotted to the generation numbers as a base, the curve obtained is termed the *Curve of inbreeding*.

Working with this formula the writer calculated values for Z in three theoretical cases:

- 1) continued brother \times sister mating;
- 2) continued parent \times offspring mating;
- 3) continued first cousin mating.

	Ancestral generations included	1)	2)	3)
Z_0	1 . . .	0	0	0
Z_1	2 . . .	50	25	0
Z_2	3 . . .	75	50	25
Z_3	4 . . .	87.5	68.7	37.5
Z_4	5 . . .	93.7	81.2	43.7
Z_5	6 . . .	96.9	89.0	46.9
Z_6	7 . . .	98.4	93.7	48.4
Z_7	8 . . .	99.2	96.5	49.2
Z_8	9 . . .	99.6	98.0	49.6
Z_9	10 . . .	99.8	98.9	49.8

The above table shows that whereas in the first case the values for Z abruptly for the first few generations and then only relatively little is made by a continuance of this kind of mating, in the second case is less abrupt, but by the time the tenth generation is reached, the are practically equal to those for the brother \times sister mating. In the case the maximum value for Z never rises beyond 50.

The writer illustrates his method by reference to two actual pedigrees.

Preliminary Note on Some Experiments with a Polymorphic Phasmid.—

RYER, J. C. F. in *Journal of Genetics*, Vol. III, No. 2, pp. 107-111 Cambridge, September 1913.

Among a large brood of stick insects (*Clitumnus* sp.) reared from the by Mr. E. E. Green, Government Entomologist in Ceylon, it was noticed though the males were all similar, two distinct types of females were present, viz. horned green and hornless yellow, while the males were all green and chocolate brown. A female of each type was isolated from the brood and, as the males and females had been left together after reaching maturity, it was assumed that both these females had paired. The parents were as shown in the table (p. 1882).

It is evident that the characters of the presence and absence of horns are hereditary, as also are those of colouration, and with respect to both it is worthy that no intermediates occurred, so that every individual could be assigned directly to one of the four classes. The connection between the presence of horns and the green colour, suggested by the original brood, clearly does not exist and the two pairs of characters are probably quite

Brood Number	Parentage		Males	Females			
				Green		Yellow	
	Female	Male		Horned	Hornless	Horned	Hornless
1	Horned green	× Unknown	13	8	3	10	—
2	Hornless yellow	× "	4	—	—	—	—
3	Hornless green of brood 1	× of brood 1	48	—	38	—	—
5*	Horned green	× "	30	3	8	8	—
6	Horned green	Parthenogenetic	—	12	10	—	—
7	Hornless yellow	× of brood 1	Died young. Some females with horns.				
8	Hornless yellow	× "	10	—	—	1	1
9	Horned yellow	× "	46	4	6	18	—
10	Horned yellow	× "	24	4	2	17	—
11	Hornless yellow of brood 2	× of brood 2	47	—	12	—	—

* Brood 4 died young.

independent of each other. Finally, and most important, is the definite evidence in brood No. 6 of the segregation of Mendelian factors in parthenogenetic reproduction. There appear to be no previous records of this phenomenon and consequently confirmation is desirable; at the same time the absence of males and the fact that the segregating character is strictly female seem to be strongly in favour of the correctness of the result.

Assuming that three pairs of Mendelian characters are involved, presence and absence of horns, yellow and green colouration, and male and femalehood, the results of each brood are discussed separately. On the whole the experimental numbers do not agree well with those expected from the above hypothesis, but it should be noted that there was a very high mortality during the early stages of the insects' life, which may account for some of the discrepancies.

1355 - **The Inheritance of Coat Colour in Horses.** — ANDERSON, W. S. in *The American Naturalist*, Vol. XLVII, No. 562, pp. 615-624. Lancaster, Pa., October 1913.

Using the tables of Sturtevant, Hurst, Wilson and Harper on the inheritance of coat colour in horses, as well as his own relating to the American Saddle Horse, the writer tabulates anew 12 377 matings involving the colour of 37 131 horses.

Chestnut always behaves as a pure recessive, while grey and roan are dominants. The writer examines carefully the chestnut matings with brown and bay, as well as the matings of the three latter colours with

other. There are many difficulties in the way of a simple explanation of results, chief of which are the methods of registration, which make the line of demarcation between the three colours very uncertain and may account for the discrepancies in the tables. The writer suggests the following series of factors:

Chestnut recessive to all
 Black dominant to chestnut but recessive to brown
 Brown " " chestnut and black but recessive to bay
 Bay " " brown " " gray
 Gray and roan dominant to bay.

16 - **Live Stock Breeding in Prussia during the Last Twenty-five Years** (1). — HORSCH and HITTCHER in *Verhandlungen des Königlich Preussischen Landes-Oekonomis-Kollegiums*, pp. 83-117 and 227-241. Berlin, 1913.

The total number of cattle existing in Prussia in the year 1883 was 37 641, or 15.4 head per 100 acres of area and 312 per 1000 inhabitants. In the year 1911 the total number amounted to 11 682 234, or 20.5 per 100 acres and 287 per 1000 inhabitants. Between 1883 and 1911 young cattle under the age of two years (including calves) increased by 64 per cent., cattle above two years of age by 19.5 per cent. and cows by 25.5 per cent.

The number of pigs increased in the same period from 5 819 136 to 244 855, or from 9.5 to 20.07 per 100 acres and from 210 to 423 per 1000 inhabitants.

In 1883 the number of sheep was 14 752 328, but in 1911 it was only 72 489, or 533 per 1000 inhabitants in 1883 and 107 in 1911.

The goats were 1 679 686 in 1883 and 2 235 529 in 1907, or 62 and 58 per 1000 inhabitants respectively.

The amount of meat produced for Prussia from Prussian live stock was 66 lbs. per inhabitant in 1883 and 109.5 lbs. in 1911. In the latter year pork constituted 70.6 lbs., or 64.5 per cent., beef and veal 34.5 lbs., or 31.5 per cent., mutton 2.5 lbs., or 2.24 per cent., horseflesh 1.3 lbs., or 1.2 per cent., and goats' flesh 0.6 lbs., or 0.5 per cent.

The production of meat by Prussian live stock has considerably increased since 1883, but the increase in the number of head of cattle has not kept pace with the increased population. Only the number of pigs increased more rapidly than the population, but the increased production of pork has been accompanied by a diminution of mutton. The writers attribute the greater productiveness of the live stock to the increased average weight of the animals and to their precocity. According to the census the carcass-weight per head of the cattle slaughtered in Germany was by 27 per cent. from 1880 to 1905, that of pigs by 5.3 per cent., that of sheep by 17.7 per cent. In 1892 the number of adult cattle slaughtered was 15.8 per cent. of the whole number of the adult stock, while in 1907 it was 19.8 per cent. In 1892, 27.8 per cent.

(1) For horses, see No. 389, B. April 1913.

(Ed.)

of the cattle under two years of age were slaughtered, and in 1907 35.5 per cent. Of the increased precocity in pigs, evidence is afforded by the fact that while in 1892 77 per cent. of the pigs slaughtered were under one year of age, in 1907 there were 86 per cent. below that age. The number of pigs slaughtered every year in Prussia averages 104 per cent. of the number existing at any one time.

The development of Prussian animal husbandry during the last quarter of a century is clearly shown by statistics on the trade in live stock with the other States of the Empire. While in 1886 Prussia exported 34 498 head of cattle more than she imported, the difference between exports and imports in 1911 rose to 152 196 head; the capacity of exportation has thus increased in 25 years by 117 698 head, or 341 per cent. In pigs, in 1886 the excess of those imported from the other States of the Empire over those exported was 47 189, while in 1911 there was an excess of exportation of 2 049 941 head; the capacity of exportation for pigs thus rose by 2 097 137 head. The exportation of pigs into the other States of the Empire was, in 1911, thirty-seven times greater than the importation of pigs into the Empire. The excess of exportation of cattle in the federated States was, in 1911, 630 458 head lower than the imports into Germany. The yearly greatest production of all kinds of meat in Prussia as compared with that of 1883 in round numbers 1 170 000 tons, or 141.6 per cent.

Like the production of meat, the production of milk has increased in Prussia during the last 25 years, though to a less degree. The value of the milk produced in Prussia in 1911 amounted to upwards of £ 87 000 000. The number of milch-cows has increased from 5 133 226 in 1883 to 6 441 441 in 1911, and the income from milch-stock has reached that derived from bread cereals. For the whole Empire, the value of milk and milk products was calculated in 1912 to be somewhere about £ 150 000 000. Besides this home production, the imports of milk, butter and cheese amounted in 1911 to about £ 9 400 000. The imports of milk and milk products into the German Empire exceeds by about £ 8 430 000 the exports of the same products and is £ 50 000 more than the imports of meat and live stock.

The progress achieved in Prussia during the last 25 years in live stock breeding is shown also by the build of the animals, as can be seen in the shows of the "Deutsche Landwirtschafts-Gesellschaft" (German Agricultural Society). Many breeds of cattle have become fixed in this time; their shapes have improved and their strains become uniform. Great progress has especially been made in pig breeding by the creation of new breeds, such as the Improved German ("Deutsche Edelschwein"), the Improved Country pig ("Veredelte Landschwein") and the Hanoverian Black-spotted pig. The progress in goat breeding is such that it has become independent of foreign countries.

In the last quarter of a century breeding associations have been founded and herdbooks started. The success which has attended these departures may be judged from the following table:

Year	Number of Breeders' Associations				Number of performance testing associations	Number of cooperative associations for the sale, etc., of live stock
	cattle	pigs	sheep	goats		
1888	14	—	4	—	—	—
1913	523	139	6	573	c. 500	c. 200
Increase	509	139	2	573	c. 500	c. 200

If all the breeders' associations in 1912, 434 were under the control of the "Deutsche Landwirtschafts- Gesellschaft". The Chambers of Agriculture worked in harmony with the special associations for the progress of the breeding, a great portion of the State subventions passing through their hands. In the year 1903 the sums paid by all the Prussian Chambers of Agriculture for the promotion of stock breeding amounted to £ 95 658, in 1910 to £ 155 644. The State subvention amounted in 1888 to 700 for all branches of stock breeding with the exception of horses, in 1913, including the additions from the "East and West funds" (1), 86 000 in round numbers.

For the supervision of breeding work and for advising breeders there are at present in Prussia 73 Inspectors of breeding and (without considering the like) some 200 other agricultural officials who occasionally take part in the work. In the year 1888 no Inspectors or agricultural officials had yet been appointed.

The breeders and officials are educated in nine agricultural colleges, 8 agricultural middle schools and 229 lower schools. There are, besides, associations like the "Deutsche Landwirtschafts- Gesellschaft", the "Deutsche Gesellschaft für Züchtungskunde" (German Live Stock Association), the "Königliche Preussische Landes- Oekonomie-Kollegium" (Royal Prussian Committee on Agricultural Economy) which offer abundant opportunities for instruction by holding lectures and publishing technical works, leaflets.

Lastly the writers discuss the measures to be adopted for the further progress of stock breeding in Prussia; in agreement with the "Landes-Ökonomie-Kollegium" they lay down the following lines:

1. Statistical information for practical breeders on the present situation and duties of stock breeding from the point of view of private and public economy and a clear demonstration of the causes of success or insuccess in stock keeping.

) These are two permanent funds for the improvement of the agriculture of the East and from which stock breeding also is assisted. (Ed.).

2. Promotion of colonisation in all places where the present distribution of property opposes the extension of stock breeding.

3. The most careful observation of the diminution of live stock which is taking place in many localities, for technical reasons, in connection with the cultivation of sugar beets both on large and on small farms, and furthering of all endeavours in favour of improved breeding, and of the spreading of performance test associations.

4. Closer union between the Chambers of Agriculture and small farmers.

5. Inducing the local live stock insurance associations to assist the smallest owners of stock, especially pig-keepers.

6. Promoting a cheaper and a more hygienic way of keeping stock, especially among small farmers, by means of permanent pastures.

1357 - **Feeding Experiments with Dried Beer Yeast for Horses.** — CZADEK, C. von in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year Part 9, pp. 879-889. Vienna, September 1913.

The experiment was conducted on two horses with the object of ascertaining if yeast can replace oats in the rations, or not. The horses, weighing about 880 lbs. each, were given during the experiment, which was divided into three periods of seven days each, the following daily rations divided into three feeds.

Fodder	Period 1.		Period 2.		Period 3.
	Horse I	Horse II	Horse I	Horse II	
	I	II	I	II	III
Hay lbs.	6.6	6.6	6.6	6.6	6
Chaff "	2.6	2.6	2.6	2.6	2
Oats "	6.6	3.3	3.3	6.6	—
Yeast "	—	0.66	0.66	—	1
Potato-meal, "	—	1.3	1.3	—	2

Feeding potato-meal with yeast instead of the half or full ration of oats was carried out simply with the object of replacing the carbohydrates with yeast. As the digestible protein content of the meal is less than that of the yeast, it might be expected that the utilization of the fodder given with it would be rather diminished than increased. Before the commencement of the experiment, and between one period and the other, a preliminary feeding period of four days was introduced. During the experiment the animals did not work; they were, however, taken out every day and exercised at a foot pace.

In order to determine the degree of utilization of the fodder this was always carefully weighed and examined before being given to the horses, whose droppings were also examined daily.

From the results given in tables, it appears that by replacing half of the rations of oats by yeast, all the nutritious elements, with the exception of fat, were better utilized than with the full rations of oats. The substitution of the whole ration of oats by yeast has the consequence that besides fat, crude fibre also was less utilized.

The effect of yeast was better when half the oat ration was substituted than when the whole was replaced. In both cases, however, the utilization quotient stood higher than with the full ration of oats. As to how far yeast is superior to oats for putting on flesh could not be determined, owing to the shortness of the time covered by the experiment. Feeding on yeast caused no change in the droppings. The writer concludes from the experiment that in practice it is possible to replace with success at least a part of the oats by yeast.

158 - **Mule Breeding in Poitou (1), France.** — FOUCHARD, P. and HOUMEAU, A. in *La Vie Agricole et Rurale*, Year 2, No. 33, pp. 188-195. Paris, July 19, 1913.

Mares. — The mares used in Poitou for the breeding of mules are of northern origin and their ancestors were probably imported about three hundred years ago from Holland and Flanders. They are powerfully built heavy animals that have a strong resemblance to mules and are therefore considered specially adapted for the breeding of the latter. Their withers eight averages 15 $\frac{1}{4}$ to 16 $\frac{1}{4}$ hands; the head is long and thin, the lips overhanging and the ears pointed and long. The neck and chest are flat, the legs powerful but coarse and very hairy. The colour of the coat various.

For the improvement of the breed, about the year 1860 Flemish stallions were introduced, later Percheron and Boulogne stallions and Breton mares. For the last thirty years a Studbook Association has existed. The improved breed is composed of animals with more powerful necks and chests than those of the unimproved strains. The best mares are mostly found in the moor districts of La Vendée and of the Department of Deux Sèvres.

The mares are served between February and June; the foals are usually weaned at the age of six months. For the production of mules, fillies begin to be used at the age of two years. Fillies of this age, at the chief market, Maille-les-Marais, fetch from £24 to £36. Colts somewhat over two years of age £32 to £48 and upwards.

Jacks. — The jacks used for the production of mules are commonly called "baudets". They have powerful heads, long and large ears, small eyes and deeply built bodies, with round cruppers, and coarse legs with small hoofs. The colour should be dark; light coats and black muzzles are

(1) See No. 711, B. June 1913.

(Ed.).

avoided. For breeding purposes, jacks with long and curly hair are preferred, as their offspring are credited with putting on flesh better than others.

The jack is always kept in the stable, and fed on hay straw and some oats. During the service season the rations are increased and some wheate or rye bread is added to them. The breeding of "baudets" is limited exclusively to private studs in the district of Melle in Poitou. The asses are mated in August and September, immediately after the close of the service season for mares. After weaning, which takes place at the age of nine months, the foals are kept in stables. They begin to breed at the age of 2 ½ years.

The sales of jacks are held at the owners' stables. At the age of nine or ten months the animals are worth £40 to £100, at the age of 2 ½ years £80 to £160, and at 4 years they are paid £200 to £240. First-class animals have not infrequently fetched £320 to £400. The trade in she-asses is insignificant; they are sold at between £16 and £60.

Mules. — The mule of Poitou is especially suited for heavy work. Its neck is broad and muscular, its back is straight, the chest broad and deep, the loins broad, the croup round, the legs very powerful with broad joints and small cylindrical hoofs. It stands 14 ¼ to 15 ¼ hands high. Its hair is short, rough and generally dark coloured. If the muzzle, the inside of the edge of the ear and the insides of the thighs and fore legs are silvery white, then the black colour of the coat is called "boyard"; if these spots fail, the coat is described as "bouchard".

The young mule accompanies its dam in the pasture until it is weaned usually at the age of seven or eight months. After this it is fed in the stable and when it is two years old it is broken in. Preparatory to being sold abroad at the age of three or four years, the animals are kept in dark stables and fed with good hay, barley, oats and maize. They are sold only at the farm. Recently weaned foals are mostly sold to the Danphiné, Provence, Charente and the northern part of Vienne. The prices range from £24 to £41. Fattened foals from Poitou at prices of from £36 to £76 are imported to Spain, the province of Languedoc, Algeria, Belgium, Germany and Italy. A certain number of mules are exhibited every year in Paris at the general live stock show. For the improvement of the breeding of mules, the most important step would be better support on the part of the State.

1359 - **Comparative Trial of Ostfriesland and Simmental Cows in Hungary.** UJHELYI, E. in *Oesterreichische Milcherzeugungs-Zeitung*, Year 20, No. 14, pp. 215-217; No. 15, pp. 231-233. Vienna, July and August 1913.

A test was made throughout the year 1912 at the Agricultural College at Magyaróvár to determine whether the Ostfriesland or the Simmental was the more suitable milk-cow for Hungary. The Ostfrieslands were 22 four-year-olds, some black and red, others whole red; they were imported from their native country; all but one calved normally. The Simmentals were 33 six-year-olds bred on the farm; twelve of them aborted. All the cows were recently calved when the trial began, and they averaged 34 days in milk. The chief results are shown in the accompanying table.

Breed	Average milk yield	Fat content			Production per 100 food units ^(*)		Performance of best cow	
		max.	min.	av.	milk	butter	food units consumed	milk produced
	lbs.	%	%	%	lbs.	lbs.		lbs.
Friesianland	8 096	3.51	2.51	3.02	236.5	7.83	3 746	11 273
Simmental	7 590	4.26	3.0	3.6	235	9.46	3 771	13 438

(*) The food unit adopted was 1 kg. (2.2 lbs.) of concentrated food, consisting of a mixture of bran, pulse and groats.

The writer notes that the yield of the Simmentals was very likely reduced owing to the number which aborted; but he believes the Ostfriesian to be a more economical milk-producer in Hungary, and that it should be adopted on farms which have a plentiful supply of fodder and aim at quantity of milk.

- **Comparative Fattening Experiments on Marsh and Moor Pastures in Germany.** — TACKER, in *Jahrbuch über Neuere Erfahrungen auf dem Gebiete der Landwirtschaft und des Futterbaues*, Year 1, pp. 17-33, Hanover, 1913. Experiments have been begun on the fattening of bullocks on a moor pasture and a marsh pasture.

- **The Zigaya Sheep.** — RODICZKY, von in *Zeitschrift für Schafzucht*, Part 10, pp. 228-233, Hanover, October 1913.

The Zigaya sheep, known also under the names of Czigáj, Czigárka, Czík, Berké, is the predominant breed for the production of wool in the south of Europe, especially in the Balkan countries; besides being bred for wool it is also kept for its milk and flesh. The wool of the thoroughbred animals is a pure white, but most of the Zigaya wool in commerce is red and generally gray or streaked with black. The best Zigaya wool is suitable for cloths. Some decades ago Zigaya wool was exported in large quantities to Western Europe.

In the Balkans the Zigaya sheep form the flocks of the wandering shepherds, who pay no attention to the breeding of their animals. There are very few pure breeds and a uniform type is rarely to be met with in the flocks. For the improvement of the breed, Merinos, Hampshires, Friesian sheep and even Charmoise Mutton sheep have been introduced, but to a limited extent. The use of Friesian rams led to an increase of the milk yield and an improvement in the quality of the wool, while the Hampshire blood caused a better conformation of the body and greater docility, but a deterioration of the fleece. The Merino rams benefited the quality of the wool. Zigaya sheep are often mated with other sheep, which are raised in their neighbourhood, and from which, notwithstanding the data found to the contrary in the literature on the subject, they are easily distinguished. Recently the efforts of

breeders in several localities have been turned to a rigorous selection and to the elimination of the Zackel blood. The State in Hungary assists the endeavours by breeding good rams in the stud farms at Fogaras and Kolozsmonostor, and in the agricultural schools at Algyógy, Szent Imre, Rima and Szombat and selling them to sheep breeders. At Fogaras the constant elimination of spotted lambs has already succeeded in producing a perfect white fleece and destroying the last traces of Zackel blood. At Kolozsmonostor and in other localities, suitable selection for a short time has resulted in increasing the height at the withers, the girth and the live weight of the breed.

The pure-bred Zigaya sheep is well built and its size is intermediate between the large Zackel sheep and the common wool sheep. At Fogaras the live weight of an improved two-year-old ram averages 94 $\frac{1}{2}$ lbs., and ewes in milk 77 to 86 lbs. Old rams may reach 132 to 143 lbs., and old ewes 97 to 110 lbs. The Zigaya sheep have a small clean head with a tapering muzzle. The horns, when present, are ringed and curved in a spiral; if they are not spirally curved, as in the Banata Zigaya, it may be inferred that Zackel blood has been introduced. The rams are almost always horned and the ewes hornless. The face and legs are mostly covered with short stiff black hairs. White legs show, according to the writer, the presence of Merino blood. Often individuals with coffee-brown and rusty legs or black and brown spots on the face occur; the latter seem specially suited for the production of milk and the black-headed animals for meat. The latter are highly esteemed in the meat markets of Vienna and Constantinople.

The milk production, as in the Zackel breed, is about 26 to 44 quart per annum, averaging 31. It is richer in fat than the Zackel milk, and this shows also in the increase of size of the suckling lambs. At Kolozsmonostor, after standing 48 hours, Zigaya milk gave from 15 to 29 per cent. of cream, while Zackel milk yielded only 15 to 23 per cent. The lactation period varies according to the conditions of the pasture and lasts, according to observations made at Algyógy and Fogaras, 120 to 135 days. At Algyógy the daily yield of milk was found to be 0.253 quarts (= 0.086 lb. of cheese) per head, and at Fogaras 0.295 quart (= 0.130 lb. of cheese).

Lastly the writer states that the Stogosch and Burzan sheep, existing together with the Zigaya sheep and mostly considered as a separate breed, are only a cross between Zigaya and Zurkan sheep.

1362 - **Digestibility Experiments with Sheep. Para Rubber Seed Cake.**—*See* S. J. M. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 429-433. Cambridge October 1913.

The writer undertook a feeding trial with three Kent sheep to determine the digestibility of a cake made from Para rubber seeds, which are at present available in considerable quantities and likely to become more so in the future. The cake was light brown and very friable, and when tested for prussic acid failed to give any reaction, though the seeds themselves yielded 0.048 per cent. Its composition was as follows:

	per cent.
Moisture	9.27
Crude protein	29.84
Crude fibre	3.15
Ether extract	20.11
Nitrogen-free extractive matter	33.08
Ash *	4.55
(*Containing sand.)	0.23)

The sheep received 450 gms. of cake per day in addition to a basal ration of 900 gms. of chaffed hay and 450 gms. of linseed cake; they ate their readily. The experiment was divided into four periods:

- 1). 7 days of basal ration without collecting faeces.
- 2). 8 " " " faeces being collected.
- 3). 8 " " " + Para cake without collecting faeces.
- 4). 8 " " " " faeces being collected.

The coefficients of digestibility for Para cake were as follows.

SHEEP	Ether extract	Crude fibre	Crude protein	Nitrogen-free extract
.	97.4	100 *	97.5	96.7
.	97.1	100 *	91.2	92.7
.	97.3	100 *	84.0	96.7
Average	97.2	100	90.1	95.3

* Containing sand.

The experiments gave results which are fairly concordant. In each the crude fibre of the Para rubber seed cake shows a digestibility coefficient actually greater than 100 per cent. The reason for this is not very clear. Possibly the Para cake offered a better medium for bacterial action, or it may itself contain a cellulose-splitting enzyme. The excess was, however, very large, and there seems little doubt that practically the whole of the small amount of fibre of the rubber cake was digested. The figures obtained show the Para cake to be one of the most digestible concentrated foods available. This is no doubt partly due to the small amount of crude fibre present. This and the absence of mucilage, as in the Para cake, means a lack of "binding" material and probably accounts for the extreme friability of the product.

- 1363 - Investigations into the Causes of Furunculosis (1). — FERDMANN, W. F. *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part pp. 384-407. Jena, September 13, 1913.

The writer conducted his experiments, which lasted almost two years at the Institute for Pathology at the University of Graz. It appears that *Bacterium salmonicida* is nothing else than a motionless strain (with its movable flagella) of bacteria which are normally mobile. The movable and the stationary types are distinguished from each other by the terminal flagella, which in the former are wound like spirilli and in the latter are straight. On applying fish agar with 2.7 per cent. of normal soda solution the movable type can be transformed into the motionless one. The movable type loses its mobility in the body of a salmonid and causes furunculosis like the stationary one. Both forms cause a brown colouring to appear in the nutritive medium, much more rapidly on fish agar than on common slightly alkaline agar.

In growth and form the mobile type resembles very closely *Bacterium fluorescens*. The writer considers it probable that the several "species" producing furuncles belong to one and the same group of bacteria, which descends from strains of *Bacterium fluorescens liquefaciens* and *non-liquefaciens*. *Bact. salmonicida* can therefore, thanks to its great variability, appear sometimes as a harmless denizen of the water or as a saprophyte; at other times as a more or less virulent cause of disease. Unfavourable conditions of life predispose the fish to infection and render the bacteria more virulent, while favourable conditions have the opposite action. The writer believes infection to be caused rather by a wound in the musk than through the intestines. The paper contains an exhaustive account of the experiments made.

FARM ENGINEERING.

- 1364 - Motor Plough Competition at Galanta in Hungary. — LINDNER, I. *Deutsche Landwirtschaftliche Presse*, Year 40, No. 76, p. 906. Berlin, September 20, 1913. — THALLMAYER, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 84, p. 232. Vienna, October 18, 1913. — MARTINY in *Maschinen-Zeitung*, Year 11, No. 19, pp. 232. Berlin, October 17, 1913.

This motor plough competition was organized by the local agricultural association ("Landes Agrikulturveein") under the patronage of the Hungarian Ministry of Agriculture. The technical and practical agricultural began in the second half of the month of July of this year and should have ended with the public trial on August 9 and 10. Owing, however, to a great number of machines, some were not tried till after August 10. On the whole 26 ploughs were tried.

The Committee published on August 9 and 10 the results of the trial of the machines that had been tried; these results are collected in the accompanying table (pp. 1894-5).

(1) See No. 1275, B. Nov. 1913.

The data given in the table as to time and consumption of fuel, etc., were obtained from an area 5 hectares (12.35 acres) in extent ploughed to a depth of $8\frac{1}{4}$ inches. The weather from the beginning of the trials on August 10, almost without exception, was favourable and did not cause any appreciable difference in the working of the machines. On August 10 the machines that had not yet been tested were: the 100 H. P. Case tractor, 55 H.P. Harvester, 40 H.P. Twin City, 85 H.P. Big four (six cylinders), 55 H.P. Hart Paar, 60 H.P. Gripp, 60 H. P. Kőszegi and a double-engine Deere-Nicholson outfit.

The results of the trials will be published by the Committee in the form of a book in the Hungarian, English and German languages; applications for the book are to be made to the above-mentioned association.

Name	System	H.P.	Time		Fuel
			hrs.	min.	
Case	Steam tractor	80	6	3	Coal
Case	Benzine tractor	40	10	14	Benzine
Caterpillar	"	60	5	54	"
Harvester	"	30 to 60	9	31	"
Titan (Hung.)	"	90	8	17	"
Lanz	Benzine rotary digger	60	10	53	"
Twin City	Benzine tractor	25 to 45	8	21	"
Fairbanks	"	25	11	9	"
Big four (4 cylinders) . .	"	4 to 85	6	54	"
Avery	"	31	14	15	"
Wiss	Motor plough	80	9	35	"
Fürst Stollberg	Benzine tractor	50	11	22	"
Mc Laren	Steam tractor	100	6	13	Coal
Mc Laren	"	50	8	3	"
Kenna	"	90	8	17	"
F. Kornick	Motor plough	90	6	41	Benzine
Stock	"	50	9	47	"
Stock with reversing motion	"	50	8	48	"
Akra	"	80	6	46	Benzol
Akra	"	80	6	46	Benzine

1365 - **The Motor Plough Competition at Parma, Italy.** — *L'Agricoltura* *Parma*, Year XIX, No. 20, p. 237. Milan, October 16-31, 1913.

The international competition of machines for working the soil organized by the Italian Touring Club under the patronage of the Ministry of Agriculture, Industry and Commerce, and held in Parma during the months of July and August of this year, has awakened much interest among the best known machine builders of the world. About thirty power ploughs of the most different systems were exhibited. Prizes were awarded to benzine and petroleum motor ploughs of the following firms: Pavesi, Tolotti and Co., of Milan; the Stock Motor Plough Ltd., of Berlin; the Compagnie Internationale des Machines Agricoles de France, of Chicago and Paris; Emerson Brantingham Implement Co., of Rockford; Alberto Baron

Oil — lbs.	Grease — lbs.	Water — lbs.	Number of workmen required	Cost of cart for implements, coals and water	Total cost per acre in Hungary	Nature of soil
					<i>s d</i>	
14.3	8.6	15 140	2	10 s 0 d	3 11	Heavy
19.8	0.4	68	2	—	4 8 ³ / ₄	Light
32.1	2.4	158	2	—	2 10 ¹ / ₂	"
19.4	0.9	1 136	2	—	7 0 ³ / ₄	"
48.4	0.2	23	2	—	5 7	"
6.6	2.2	43	1	—	5 9 ¹ / ₄	"
46.6	0.4	33	2	—	6 1 ¹ / ₂	"
5.1	2.2	1 226	2	2 s 6 d	6 5 ¹ / ₂	"
36.1	1.4	76	2	—	7 2 ¹ / ₄	"
34.1	0.7	422	1	—	5 8 ¹ / ₄	"
40.3	—	200	1	—	4 4 ¹ / ₄	"
2.9	0.2	—	2	—	6 5 ¹ / ₂	Heavy
13.0	—	12 837	2	10 s 0 d	2 9 ¹ / ₂	"
18.7	—	8 347	2	10 s 0 d	3 0	"
6.2	12.8	10 560	2	10 s 0 d	3 7	"
19.8	2.9	50	2	—	4 4 ¹ / ₂	"
47.5	1.1	6	1	—	4 8 ¹ / ₂	"
28.6	0.7	20	1	—	4 4	"
5.5	0.4	34	1	—	3 4 ¹ / ₂	"
5.5	0.4	34	1	—	2 6 ³ / ₄	"

renna; "Otav", of Grumello; Giovanni Montini, of Orvieto. Besides the steam traction ploughs of the following firms were also awarded : John and Henry Mac Laren, of Leeds; Charles Burrell and Son, of Bedford; Marshall Sons & Co. Ltd., of Gainsborough; Clayton and Worth, of Lincoln; Avery Company, of Peoria, and lastly the ring outfits on the cable system of Francesco Casali e Figli, of Pisa, and Violati Tescari, of Ariano.

In connection with this competition there was also an international competition of combustion motors for agricultural purposes, in which a classification of the machines exhibited was made by awards in money and of medals.

1366 - **Competition of Beetroot Lifting Machines in France** (1). — SAGNER, *Journal d'Agriculture Pratique*, Year 77, Vol. II, No. 40, pp. 439-442. October 1.

The trials took place on September 23 and 24, 1913, on a 20-acre in the neighbourhood of Saint-Quentin (Aisne). The ground was slightly inclined, and in a very favourable condition of moisture. Seven machines (5 French and 2 Belgian) showed about 30 machines.

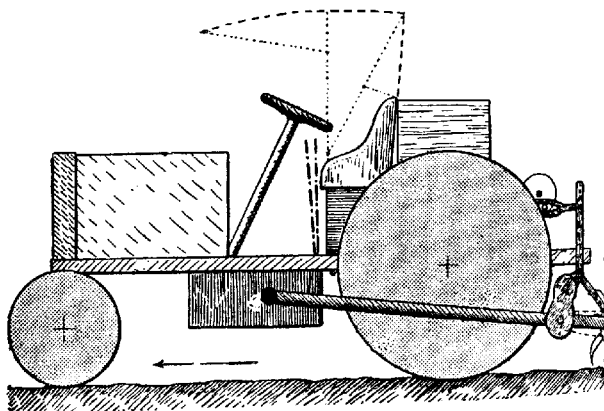
The first class prizes were awarded to :

1. An outfit on the Degrémont system which lifts, tops and d three rows of beets at a time.
2. Guichard's one-row machine, which lifts and tops the beets and them in small heaps.
3. Laloux and Bridoux' lifter ; also a one-row machine which lifts tops the beets but does not collect them.
4. Another Guichard machine, a three-row one.

The writer gives a detailed description with figures of the Degrémont outfit, consisting of two machines (beet topper and beet lifter) which in succession. In the Guichard system the beets are topped, pulled o the ground and laid in heaps by only one machine.

1367 - **Vermont-Quellenec Rotary Digging Machines**. — DE CONDÉ, *Relevé de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, Vol. No. 2, pp. 369-371. Paris, August-September-October 1913.

The writer gives a detailed description of the machine shown in accompanying illustration and of its working.



Vermont-Quellenec Rotary Digger.

(1) See No. 970, B. Aug. 1913.

The motor is of 40 H. P. It can travel at four different speeds, namely $2\frac{1}{4}$, $1\frac{1}{2}$ and 1 miles per hour. Its weight is 5.4 tons. According to data furnished by the Commission of the "Automobile Club of France" are the following results at the trials conducted at Bourges :

	First day	Second day
breadth of land tilled	67 in.	67 in.
average depth of work	5.22 "	6.38 "
seed per second	15.35 "	—
area tilled	1.88 acres	0.72 acre
time required per acre	2 h, 46 min.	—
consumption of fuel per acre	7.20 gals.	—
volume of earth loosened for one gallon of fuel.	2616 cub. ft.	—

This machine is built also in another size which is driven by a 60 H.P. and tills a strip 71 inches wide.

Hand Drill with Revolving Tube. (German Imperial Patent 264570). — *Maschinen-Zeitung*, Year 11, No. 21, pp. 256-257. Berlin, November 1, 1913.

This portable drill is of simple construction; it is easy to work and it is a considerable saving of seed.

It consists in the main of a seed hopper, provided with a belt for the convenience of carrying and whose funnel-shaped outlet issues into a horizontal zigzag-shaped revolving pipe, which ends in an immovable chamber

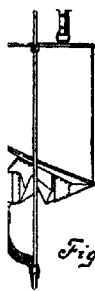


Fig. 1.

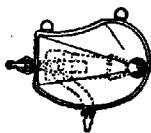


Fig. 2.

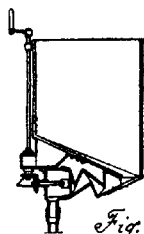


Fig. 3.

ing to an elastic tube. The further extremity of this tube is fitted with a nozzle attached to a rod, by means of which the nozzle may be directed in any direction required.

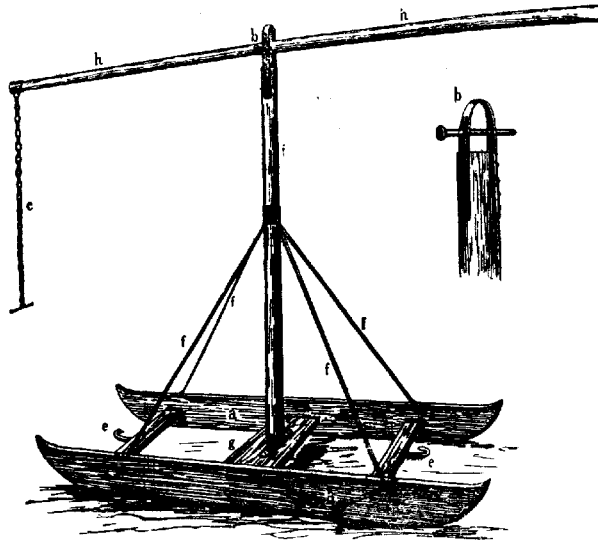
The zigzag pipe is made to revolve by means of a hand crank and a pinion gear, and according to the speed at which it is turned, more or less seed is sent into the elastic tube.

Fig. 1. shows a side view, Fig. 2 the plan and Fig. 3 the vertical section of the hand drill.

1369 - **Apparatus for Lifting Straw for Thatching Stacks.** — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 74, p. 882. Berlin, September 13, 1913.

With the apparatus shown in the accompanying figure, the work of lifting straw for thatching is much facilitated.

The working of the apparatus is very simple: when the pressed straw has been taken up by the chain (d), a man pulls the chain (c) and thus raises the straw to the top of the stack, where a man receives it, frees it from chains and spreads it on the stack. On releasing the chain (c), the lever sinks again by its own weight to its former position.



1370 - **Trial of a Barley Drying Plant.** — *HOFFMANN, F.* in *Wochenschrift für Brauerei*, Year 30, No. 36, pp. 484-488. Berlin, September 6, 1913.

The dryer shown in the accompanying figures consists essentially of a hopper, the bottom of which is formed by two frames inclined at an angle of 40° to the horizontal. Where they meet they form an adjustable slit which gives admission to an endless screw situated below it.

The cereal is conveyed on both sides through sliding openings. On both sides there are three rows of slides. When the lowest slides are opened, the frames get charged with grain to a depth of 16 inches. W

(1) See No. 1074 B, Sept. 1913.

layer is heated to 104° F. (40° C.) the next row of slides above it is opened and a layer of moister grain 8 inches deep is formed over the first and already

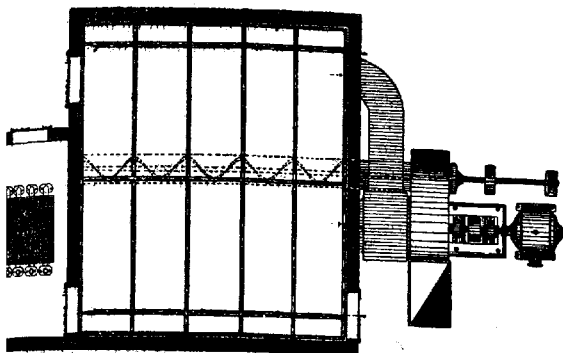


Fig. 1. — Plan.

layer. When this also reaches 104°, the third row is opened and another of barley 8 inches deep is admitted. After about an hour this also

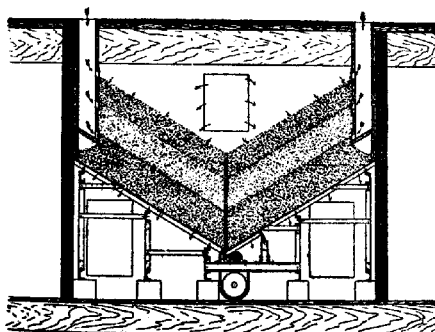


Fig. 2 — Vertical section.

reached the desired temperature; the barley is cooled, let out below and dried by the endless screw to an elevator. The driving power is supplied by an electromotor.

5. The power of germinating has not been impaired, for the deviations observed before and after drying are within the limits of error.

The annexed illustrations represent a device for drying alfalfa during rainy weather, which is at present used in Mississippi. It consists of simple home-made trucks of cheap construction resting on a pair of low wheels, thus differing advantageously from similar devices in its easy transportability. Fig. 1 shows the truck, which has a short leg in front that does not touch the ground when it is moved forward. What would make about 500 pounds of cured hay is placed on each truck, and covered with a canvas cover under which the hay is as though it were under a little tent, not touching the ground. The loader trucks are left in the field until the hay is quite dry and ready for baling. These trucks are used also for other purposes, to gather cotton or corn or any other crop. The trucks can be attached to each other and a team of mules readily draws fifteen empty trucks. Fig. 2 shows the trucks in a cotton field; fig. 3 loading up in a field; fig. 4 a train of empties.

After discussion of the conditions favourable to this industry useful to agriculture, with special considerations on the recent progress in cylinder drying apparatus, the writer gives some economic calculation on potato drying installations of different sizes and capacities, according to which the total working expenses for a one-drum "Tatösün" calculator (I) (cost of installation and machines, interest and amortization running expenses and working expenses proper) for installations working 120 days of 22 hours each per year, are as follows :

Treating 3 000 metric tons of potatoes	£	869	10
» 5 000 » »	1195	5	
» 9 000 » » »	1791	18	
» 12 500 » » »	2274	17	

Consequently the cost of drying one English ton of potatoes is 18s. 7d. 7/4, or, to be very
 t vely: 5s 7 1/4d, 4s 10 1/4d, 4s 0 1/2d, 3s 8 1/4d.

(1) See No. 1074, *B*, Sept. 1913.



Fig. 1.



Fig. 2.



Fig. 3.

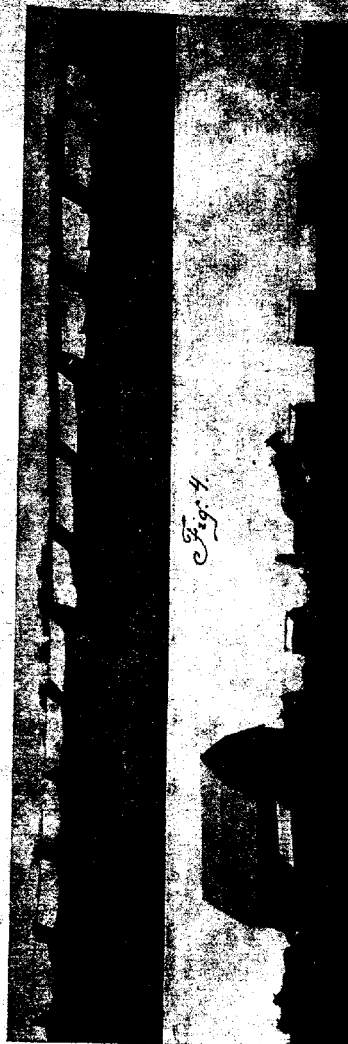


Fig. 4.

1373 - A New Instrument for Tapping Castillos. — *The India Rubber World*, Vol. XLIX, No. 1, p. 9. New York, October 1913.

The wounds caused by the tapping methods at present in vogue heal slowly and unsatisfactorily. Instead of removing a strip of bark, it is more advantageous only to raise it and allow the latex to flow. The part raised is replaced and the wound heals very quickly.

The secretaries of the Abispo plantation have invented an instrument (see fig.) which gives excellent results. It is possible to adjust the knife so that it penetrates the bark without amaging the cambium.



1374 - Test of a "Westphalia" Milk Separator capable of working 330 Gallons per Hour. — *WIRTH in Oesterreichische Molkerei-Zeitung*, Year XX, No. 20, pp. 317-319. Vienna, October 15, 1913.

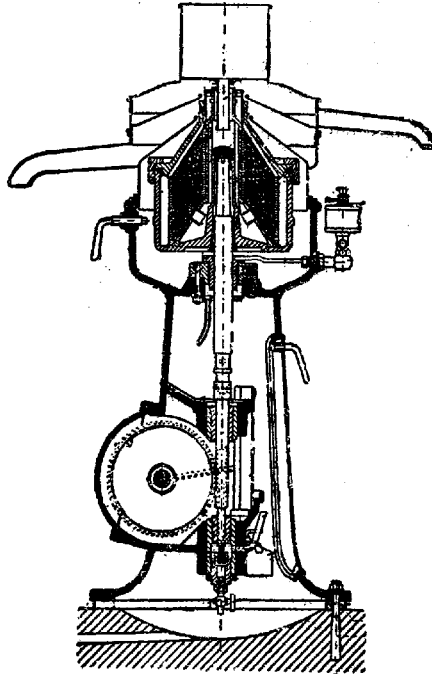
The writer begins by giving a description of the machine shown in the figure on the next page, and then reviews the experiments made with it and their results.

The machine was set up in the cooperative dairy at Gross Grünau, here during the eight months between December 1, 1912 and August 1, 1913, it treated daily from 660 to 770 gallons of milk.

On the test days samples of the whole milk, skimmed milk and cream were taken every 30 minutes and examined for fat content by Gerber's method. The examination for fat content of the skimmed milk was also carried out according to Gottlieb-Röse's analytical process. These determinations were made in the laboratory of the German Agricultural Academy Tetschen-Liebwerd in Bohemia.

The most important data and figures are collected in tables. At a temperature of 95° F. (35° C.) with a cream containing 15 per cent. of fat and working at the rate of 330 gallons per hour, the skimmed milk contained only 0.05 per cent. of fat; at a higher temperature this was reduced to 0.01 per cent. The increase in fat-content of the skimmed milk on separating at a lower temperature or with a lower percentage of fat in the cream is only 0.004 to 0.01 per cent.

These tests show that the machine works very well, and that even under difficult conditions the separation is very perfect. As no hitch in the working occurred during the eight months, and as the machine is of simple construction and easy to clean, it may be recommended, and is likely to do it well.



RURAL ECONOMICS.

1375 - **Acreage under Crops and Grass in England and Wales in the Year 1911**
 — Board of Agriculture and Fisheries, Memorandum: *Agricultural Returns of England and Wales*, 1913, 2 pp. London, October 20, 1913.

The total acreage under crops and grass in England and Wales in 1911 was 27 129 382 acres, that is 45 308 acres less than in the preceding year. The arable land, the extent of which was 11 058 233 acres, diminished by 277 043 acres, whilst the area of permanent grass and pastures increased by 231 735 acres and amounts now to 16 071 149 acres. The area under wheat was 161 776 acres less than in 1912; oats also occupied an area smaller by 97 779 acres. On the other hand the acreage devoted to barley has increased by 102 328 acres. Most other field crops show a diminished acreage, with the exception of lucerne and sugar beets which

score slight increases. Potatoes occupy 20 868 acres less than in 1912 and mangolds 66 081 less, while the acreage of bare fallow rose from 273 725 to 387 832 acres. The extent of land under clover and grass in rotation diminished by 27 181 acres, but the acreage of these crops destined for conversion into hay increased by 145 572 acres.

1376 - **Technical and Economic Investigations on the Rearrangement of Properties in Bavaria.** — Werss, A. in *Landwirtschaftliches Jahrbuch für Bayern*, Year 3, No. 9, pp. 381-484. Munich, 1913.

The writer has attempted, by means of an enquiry in the course of which he heard 125 farmers and people interested in agriculture who had taken part in the rearrangement of properties, to ascertain to what extent the rearrangement of properties made in conformity with the Bavarian law of May 29, 1886, on the subject, had answered to the technical requirements of agriculture, and what influence it had had upon farming in the rearranged districts.

In order to control the results obtained from the enquiry, he started further observations on the economical development of rearranged and not rearranged communes of the administrative district of Neu-Ulm, all of which are in about the same conditions as to their natural factors of production, which are those of normal Bavarian agriculture.

He begins by a short review of the history and of the expenses (average 100 per acre) of the rearrangement of properties in Bavaria, and proceeds to a discussion of the material collected from the enquiry and by his personal observation, giving the data in tables annexed to the paper, and arriving at the following conclusions:

In the whole territory investigated the average number of fields possessed by each person affected by the work was 9.9 before the rearrangement, and 4.6 after; the total number of fields is thus diminished by 3.5 per cent. The average extent of the fields was 0.84 acre before the rearrangement and 1.84 acre after it.

The fact that the extent of productive area of the majority of the farms ranges from 12 $\frac{1}{2}$ to 50 acres diminishes somewhat the possible degree of rounding up. However, within the limits of the same kind of soil and farming, and without prejudice to the greatest possible consideration for the economic position of the farmer in question, every effort must be made, in principle, towards complete rounding up. In general the question of the future economic possibilities gives the measure for the degree of rounding up to be attained.

A long period intervening between the notice of the operation and the delivery of the new fields is very disadvantageous for the individuals concerned and for the whole community, and is therefore to be avoided as much as possible. The rearrangement by stages and field by field is also to be condemned, since it often causes the chief advantages, such as the termination of the whole network of ditches and roads and complete rounding up, to be lost.

The want of rearrangement is not felt in all the territories comprised in the enquiry; nevertheless this idea has taken such deep root in some

districts, especially in Swabia, that a solution of this problem should be generally facilitated by means of an alteration in the law.

To the question whether the agricultural and technical works should be carried out before or after the valuation of the territory to be rearrange the answer is that the simultaneous drawing up of the plans for the network of drains and roads almost always renders a freer and more complete solution of the whole work of agricultural improvements possible, by adapting the road and drainage works to a systematic rearrangement of the land.

The writer then turns to the economic aspect of the question and treats first of the use of agricultural machines as influenced by the rearrangement. He shows that an increased, and especially a more profitable, use of machines (chiefly mowers and drills) is made in rearranged districts as compared with unarranged ones. In several localities, though, no increase of the number of machines has been observed, because the saving of time caused by the rounding up of the farms, especially in the medium-sized ones, has kept back the purchase of machines. It is questionable whether the rearrangement will have an influence on the formation of cooperative associations for the purchase of machines; while it is possible that the practice of employing contractors possessing machines to mow and to perform some other farm work may extend.

One very favourable effect of the rearrangement upon the tilling of the soil is due to the timely draining of the surface water, the better shape of the fields and the suitable construction of the roads. The manuring also and the further care of the crops, were, according to the opinion of 90 per cent. of the persons interested, considerably assisted and especially the most outlying or formerly almost inaccessible localities were benefited by the roads, being as if brought nearer, and by the complete manuring thus rendered possible they had become more productive.

As for the influence of the rearrangement upon the utilization of the soil, it is certain that rearrangement in Bavaria has favoured the transition to a better system of farming, but it cannot be said that it has led everywhere to more productive farming, for the rearrangement of whole communes has not been general; further, the abolition of the old delimitations of the three fields in the improved three-year rotation has not been carried out everywhere.

In every 15 out of 100 communes a better rotation was introduced, the cases in which individual farmers adopted a better rotation after the rearrangement are much more numerous. Only a very far-reaching rounding up, without consideration of the three-field system, can — economic conditions permitting — render more general the adoption of better farming (with rotation of crops or without it).

The question whether fruit growing has really been stimulated by the rearrangements is answered in the affirmative by 44 per cent. of the observers. The plots allotted in the neighbourhood of the farmers' houses or of the villages were in 44 per cent. of the cases planted with fruit trees, while fruit growing in the open field has been only slightly extended (17 per cent. of the observations).

As for the effect of rearrangement upon gross production, it appears that the gross produce has risen on an average about 14 per cent. The special investigation on the harvests in the district of Neu-Ulm has shown that in the rearranged communes during the last 25 years the gross yields have had an average increase of 35 per cent., while those that were not rearranged had an increase of only 17.5 per cent. It must be noted that this result was obtained in the rearranged communes notwithstanding a more moderate use of artificials on an inferior soil.

The rearrangement was not able to cause any marked influence on the increase of numbers of productive live stock, but contributed to render stock breeding steadier, owing to the surer supply of fodder in general and that from the arable land in particular.

As a further result of the rearrangement it is to be mentioned that the cost of production of crops became less, in consequence of the relative saving of 9 per cent. of human and animal labour and of 6 per cent. of the wear and tear of machines and implements. The increase of intensity in farming did not of course allow of any absolute saving of human and animal labour becoming noticeable.

The increase in the value of land due to the rearrangement amounts to 17.7 per cent., and the increase of rents to 29 per cent. A calculation made in the district of Neu-Ulm by comparing the rents paid in the rearranged and the other communes, showed that the profits in the former amounted to 5 per cent. of the capital invested.

Lastly, the writer points out the social effects of rearrangement in its bearing upon the conditions of credit, on litigation about land or water questions, on the greater attachment to the land, on the reawakening of public spirit, etc.

77 - **The Distribution of the Land, and Agricultural Progress.** — DE MONTCAULT DE VILLARDEAU, PIERRE in *Annales de la Science Agronomique*, Year 30, No 3, pp. 265-282. Paris, September 1913.

Practical agriculture has not achieved anything like the success that the considerable progress in applied sciences would lead people to expect. The writer shows that not even the industrialization of agriculture, which cannot be completely carried out on account of the special conditions of agricultural labour and capital, can show this success. Only a new division of the soil better adapted to the needs of farming can render new and important progress possible. According to the special object of the farm, and to the soil and labour conditions, the extent of the farms should be increased or diminished. The writer then shows how this could be done by renting and subrenting, by cooperative farming) and how by these means many difficult problems, as for instance, that of labour and of capital, could be more easily solved, and further how other difficulties therewith connected could be overcome without leading to a far-reaching change of existing conditions.

1378 - **Cost of Work in Farming.** — GIAGNONI, C. N. in *Agronomia*, Year 4, No. 1 pp. 273-286. Buenos Aires, August 1913.

This paper treats of the effect of the division of labour on the cost of labour, the cost of the day's work of men, draught animals and machines in certain agricultural operations, the cost of work performed by men, animals and machines together or the "complex day's work" (*jornal con puesto*), comparative cost of a given work performed by men, animals and machines.

1379 - **Farming on the Share System in the Bourbonnais, France.** — VILLATI DES PRUGNES, R. *Le contrat de métayage.* — *La vie agricole et rurale*, Year 2, No. 4 pp. 428-430. Paris, September 27, 1913.

The conditions of the share system agreement which settles the rights and duties of landowners and their farmers in the old French province of Bourbon are the following :

The landowner gives the land, dwelling house and farm buildings, the capital for the purchase of certain articles required on the farm, a portion (from a third to one-half) of the live stock ; he gives the farmer, free of charge, all the straw and the hay from natural meadows and one-half of the hay from leys, he bears the whole expense of new buildings and lane improvements, as well as of the upkeep of buildings, and one-half the money spent on market dues, castration, weighing and shoeing of the live stock, he pays all the taxes, the hire of the threshing machines and one-half of the necessary fuel. Further, he lets the farmer keep all the wood obtained from the trimming of hedges and the pruning of trees.

The farmer on his part gives all the labour required for working the farm ; he supplies the machines and implements, he performs all the compulsory work imposed on the farm by the commune and does the carting of materials required for repairs to the buildings on the farm. On entering the farm the farmer pays the landowner one-half the total value of the live stock existing on the farm after deduction of the share mentioned previously ; he pays, besides, a yearly sum called farm tax (*impôt colonique*) which amounts usually to 15 3d to 25 per acre, and which varies according to the quality of the land, the state of the buildings and the share of the live stock borne by the landowner.

The produce of the farm is halved between landowner and farmer, with the following limitations: all the produce of a garden, which is always placed at the disposal of the farmer, belongs to him; as well as all the barley crop and all the potatoes minus 30 or 40 bushels. All the service fees, the tips usual in the country on the sale of live stock, the proceeds of poultry keeping (ducks, geese and turkeys excepted) as well as from the sale of milk and milk products belong to the farmer. When a farmer enters or leaves a farm, a valuer draws up an inventory ; if at the end of the lease there is a surplus, as is almost always the case, the farmer gets one-half of it.

380 - **Measures for Increasing the Economic Success of a Farm in the Department of Gard, France.** — VIGNER, R. Comment exploiter un domaine agricole dans le Gard? Consultation, in *La vie agricole et rurale*, Year 2, No. 42, pp. 416-423. Paris, September 20, 1913.

This is a description of the farm, 208 acres in extent, and of the present system of farming. The measures to ensure success are: improvement of the soil and care of meadows and pastures, observance of a systematic rotation on the arable land, suited to the soil, climate and trend of farming, proper attention to the vineyard and to the oak plantation intended for the cultivation of truffles, introduction of the breeding and keeping of numerous and of productive cattle and sheep of the most suitable breeds.

81 - **The Estate "La Rugginosa" in the Tuscan Maremma: Example of Intense Improvement.** — DAPPLES, CARLO in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 80, pp. 958-960. Berlin, October 1, 1913.

The writer describes the development of an estate of 1174 acres from 1906 to 1911 and indicates the methods adopted: improvement of the water conditions, systematic manuring, introduction of a regular rotation, division of the estate into farms. The maximum wheat crop in 1906 was 12 bushels per acre, while in 1910 it reached 31.8 bu. The average hay crop rose from 4.2 cwt. to 23.4 cwt. per acre. The total extent of pastures was 791 acres in 1906; in 1911 they were reduced to 52 acres, but there were 278 acres of grass leys. In the winter of 1906-07 the rent paid for grazing was 4d per acre, while in 1910-11 it was 10s 10d. In 1906 the live stock on the estate were 25 oxen and cows, 6 calves and 17 horses; while in 1911 there were 69 oxen and cows, 32 calves, 4 horses and 35 pigs.

82 - **Continuous Wheat.** — BERNARD, PAUL. Blés sur blés. — *Le Progrès agricole*, Year 27, Nos. 1367 and 1368, pp. 688 and 706-707. Amiens, September 28 and October 5, 1913.

The writer is of the opinion that the continuation of the favourable conditions of the wheat market and the increasing difficulties regarding agricultural labour are the two principal causes of the ever growing importance of the cultivation of wheat, and that at the same time they warrant investigation of the practical possibility of continuous wheat growing. He then gives three instances, from which it appears that under certain conditions continuous cultivation of wheat or other cereals is not only practically possible, but also advisable from an economic point of view.

1. On the estate Arcy-en-Brie in France (Seine-et-Marne), cereals have for many years followed cereals, namely always wheat for two years in succession and then oats. The resulting crops during the ten years from 1890 to 1900 gave an average of 33.3 bushels (60 lbs.) of wheat per acre and 50.1 bushels (42 lbs.) of oats per acre. The average gross returns per acre were: £8 16s per annum, so that after deducting £2 2s 3d for manures there remained £6 13s 9d for wages, rent and profit.

2. — The English experiment station at Rothamsted has, since 1843, sown wheat year after year on the same field in order to determine the influence of certain manures upon the yield. The crop on the plots which received no manure since 1843 was 12.2 bushels per acre in 1908 (the

average of the 65 years being 13.0 bu.), while the farmyard manure plot yielded 39.7 bushels (the average for the 65 years being 35.7 bu.).

3. — On the Blount estate in England cereals have been continuously grown since 1865, with the following results: the average crop of the last 25 years was 35.6 bushels of wheat and 39.5 bu. of barley. Between 1900 and 1904 the gross returns per acre of wheat were £7 18s, which, after deducting £6 9s 6d for expenses, left £1 8s 6d for net profit.

1383 — **The Cultivation of Tea in Small Holdings.** — REINJUST, A. E. in *Medeleningen van het proefstation voor thee*, No. XXIV, pp. 2-8. Buitenzorg, 1913.

The writer gives an account of the expenses of planting and managing small tea plantations of 25 and 50 bouws (44 and 88 acres) in area, similar to those being developed in India and Ceylon. The figures given are approximations and do not include interest on capital expended (See table below. One florin = 1s 8d or \$ 0.40).

A plantation of 50 bouws is large enough to run its own factory, with an outlay of about 30 000 florins, but for a plantation of half the size it would not be economical.

Plantation of 50 bouws.

	Years					
	1st	2nd	3rd	4th	5th	6th
Expenses:						
Clearing	12 500	—	—	—	—	—
Seed	5 000	—	—	—	—	—
Nursery	200	100	—	—	—	—
Upkeep of plantation	—	3 000	3 000	3 000	3 000	3 000
Manure	—	—	—	1 250	1 250	1 250
Manager's bungalow	500	3 000	—	—	—	—
Coolie lines	500	500	—	—	—	—
Buildings	1 000	—	—	—	—	—
Repairs to buildings	—	100	200	250	250	250
Roads and water	500	500	500	100	100	100
Administration	3 600	3 600	3 600	3 600	3 600	3 600
Labour	600	600	600	600	600	600
General Expenses	2 000	2 000	2 000	2 000	2 000	2 000
Overseer's salary	1 200	1 200	1 200	1 200	1 200	1 200
Sundry	400	400	900	—	—	—
Total	28 000	15 000	12 000	12 000	12 000	12 000
Receipts	0	0	1 250	6 250	15 000	35 000

Plantation of 25 boms.

	Years					
	1st	2nd	3rd	4th	5th	6th
<i>Expenses:</i>						
aring	6 250	—	—	—	—	—
d	2 500	—	—	—	—	—
ery	100	50	—	—	—	—
keep of plantation	—	1 500	1 500	1 500	1 500	1 500
nure	—	—	—	625	625	625
nager's bungalow	500	3 000	—	—	—	—
ole lines	200	300	—	—	—	—
ildings	500	—	—	—	—	—
pairs to buildings	—	100	150	175	175	175
ads and water	500	500	500	100	100	100
ministration	3 000	3 000	3 000	3 000	3 000	3 000
bow	300	300	300	300	300	300
peral Expenses	1 200	1 200	1 200	1 200	1 200	1 200
ply	50	50	50	—	—	—
Total	15 100	10 000	6 700	6 900	6 900	6 900
<i>Receipts</i>	0	0	625	3 125	7 500	12 500

1 - Proportion of Area Occupied by the Various Crops and Net Profit. — OSTERMAYER, A. Pflanzenbau und Reinertag. — *Zentralblatt für Landwirtschaft*, Year 93, No. 18, pp. 205-208. Brünn, September 16, 1913.

The solution of the problem of bringing the land to the highest degree of profitability is in the first place dependent upon a suitable arrangement of the farm. The writer attempts to prove the truth of this statement by showing the reciprocal connection between the most important crops, the rotation followed and the manure used, and their effect on the profitability of the farm, availing himself of the observations made on the books of 9 Moravian peasant farms, the average extent of which was 73.66 acres.

On grouping the farms according to the area of meadows and pastures, no seems to be obeyed by the net profits in their oscillations. This is fully explained by the fact that the favourable action of the meadows on the crops of the arable land is due only to the transformation effected by the stock of the fodder produced by the meadows into farmyard manure, consequently it is not the area alone of the meadows that is intimately connected with the crops of the arable land, but also and to a great extent the nature of the meadows and the amount of their yield. If the farms are grouped according to this point of view it appears clearly that the existence of good meadows is capable of considerably increasing the crops:

Group	Hay crop per acre: lbs.	Net profit per acre	Wheat crop in lbs. per acre	Hoed crops in lbs. per acre
		£ s d		
I	3 529	2 11 9	1 633	16 565
II	2 375	2 5 3	1 470	16 479
III	1 706	1 19 6	1 403	14 131

The writer then divides the farms into three groups according to the proportion in which the land devoted to the production of fodder stands to the arable area, and at the same time according to the kind of fodder grown. Group I includes 26 farms which have developed their present rotation mostly a six-year one, from the old three-year rotation, and consequently sow to clover at most one-sixth of the arable area. Group II comprises those farms which devote one sixth to one-quarter of their land to clover; these are eight farms following the Norfolk rotation and eight with a five-year rotation. Group III includes all those farms in which the rotation allows of more than a quarter of the area being devoted to forage crops. The greater extension of forage, which can only be obtained by leaving down the leys for two or three years, is found in 27 of the farms.

Group	Kind of fodder	Proportion of fodder in arable area	Net profit per acre
			£ s d
I	Clover	up to $\frac{1}{6}$	2 10 3
II	Clover	$\frac{1}{6}$ — $\frac{1}{4}$	2 11 6
III	Clover and grass leys	more than $\frac{1}{4}$	2 2 9

The farms which grow clover by itself prove more profitable than those which include grasses in the ley, and the profit in the former is greater where the greater extent is given to the nitrogen-fixing clover.

With increasing intensity of cereal production, as is shown by the observations, there is an increase in the value of the soil, of the stock and of the total value of the farm, as well as in the income from the sale of the crop. The outlay on labour increases also, so that the extension of cereal cultivation is equivalent to a general intensifying of the farm, but not to the extent of affecting its profitability. This is clearly shown by the following table, in which the work of the owner is valued at £3 2s 6d per month, and the rate of interest of the whole capital invested in the farm

placed opposite to the most important figures showing the ratio of the areas occupied by the various crops to each other.

No.	Net profit per acre	Interest on capital invested	Ratio of area of crops				Cereals	Forage	Cereals and forage in percentage of acreage	Area of meadows and leys in percentage of acreage
			Cereals	Hoed crops	Forage	Various	In percentage of acreage devoted to cereals and forage			
	£ s d									
I	2 9 11	2.0	67.2	14.1	15.2	3.5	81.5	18.5	82.4	24.6
II	3 2 9	4.1	61.4	16.2	20.3	2.1	75.1	24.9	81.7	32.0
III	2 2 6	2.5	57.4	14.9	21.7	6.0	72.5	27.5	79.1	32.4
IV	2 3 6	0.3	52.1	12.9	27.7	7.3	65.2	34.8	79.8	37.3
V	2 8 6	2.3	45.7	13.2	28.6	12.5	61.5	38.5	74.3	33.6

The extension of cereals thus takes place at the expense of the area occupied by forage plants, which is not without importance for the provision of nitrogen for the cereals. Of great interest is the second fact, namely that the rate of interest on the capital varies directly with the extent of area devoted to hoed crops.

Limits of Profitableness of Farm Expenses in the Peasant Farms of Moravia. — OSTERMAYER, ADOLF in *Zentralblatt für Landwirtschaft*, Year 93, No. 20, pp. 229-233. Brünn, October 16, 1913.

The writer investigates to what extent intensifying the amount of capital and labour influence the economic success of Moravian peasant farms. With this object in view, he divides the peasant farms into groups by a system of units according to the amount of capital and labour employed on them, then observes the net returns and the rates of interest of the capital tied in the property.

In this way he investigates first the effect of the intensification of the amount of capital invested in live and dead stock (see Table A) and finds that with the increasing amount of this capital, not only do the net returns increase, but also the rate of interest of the whole capital: thus from -5.2 in Group I to +3.9 per cent. in Group VI. Group VII, on the other hand, shows a falling off in both signs of profit, which signifies that the conditions of production obtaining in these Moravian farms the maximum of profit is reached by the farms of the sixth group with an intensity of 11 to 12 points.

Similar results are obtained by examining the degree of intensity of circulating capital (Table B). The limit is reached here by Group III, with a net income of £3 1s 8d per acre and an interest on capital of 3.6 per cent. The grouping of the farms according to the whole working capital, as shown by Table C, reveals that the highest returns per acre and the highest rate of interest are reached by Groups II and III; beyond this a falling in both takes place. It follows that the net returns increase with the increase of the working capital up to £3 1s to £3 5s 9d per acre and to an interest of 3 to 3.9 per cent. on the total capital; beyond this limit, and always allowing the farmer £3 2s 6d a month in return for his work, an investment of more capital in the farm is not advantageous, because the greater return it causes does not bring in the rate of interest usual in the locality.

Table D shows the effect of increasing the amount of human and tea labour. It shows first that the net returns increase with the intensity of labour. A closer examination proves that the work of the farmer and his family contributes an ever increasing share to the increasing net return. The rate of interest, however, does not run parallel with the net return but reaches its maximum with a medium intensity of work at four points in Group II, beyond which it sinks considerably. From this the writer draws the conclusion that in rendering farming more intensive, capital must be considered as the dominant factor and that the greatest foresight is necessary in increasing the intensity of the labour factor.

From the figures of Table E, which contains a grouping of the farms, it is seen that the economic importance of these principles is not yet sufficiently recognized. The farms with increasing total intensity show increasing net returns up to Group VIII, but the figures showing the rate of interest do not follow a parallel course. The ascending tendency connected with greater intensity is so frequently and so deeply perturbed that it does not appear any more to follow a law; and in no case does the rate of interest reach the 3 to 3.9 per cent. which was observed in considering the degree of intensity of the capital or of the labour employed. For the increase of intensity to give good economic results "each of the outlays on labour and capital must be increased in the most suitable ratio of effectiveness towards each other" (Aereboe).

The limit of the increase of intensity of a farm depends further to a great extent upon the economic and natural conditions of production prevailing at the time. The terms *intensive* and *extensive* must not be taken in the sense of an absolutely higher or lower outlay of capital and labour per acre of land, but in the sense of a relatively high outlay in relation to given economic and natural conditions.

This is proved by Table F, in which the influence of the natural and economic situation as well as the size of the farm upon the profitability of intensifying is shown. The net returns here increase, in the most favourable natural situation (Group I), with the increase of intensity. This holds good for Group II also. In the less favourably situated Group III an increase of cultural intensity to the extent which is still advantageous in a better natural situation, is here no longer economically justifiable.

Group of farms	Degree of intensity: points	Total value of farm: crows per hectare	Work done by farmer: man- months per ha.	Net returns: crows per ha.	Value of farmer's work: crows per ha.	Interest on capital	
						crows per ha.	per cent.

A. — Intensification of capital in live and dead stock.

I	up to 6	1 173	1.73	68	130	— 62	— 5.2
II	7	1 446	1.54	131	116	+ 15	+ 1.0
III	8	1 959	1.13	142	85	+ 57	+ 2.9
IV	9	1 977	1.20	147	90	+ 57	+ 2.8
V	10	2 448	1.55	186	116	+ 70	+ 2.8
VI	11-12	2 651	1.21	195	91	+ 104	+ 3.9
VII	13-16	3 907	1.63	165	122	+ 43	+ 1.1

B. — Intensification of circulating working capital.

I	1	1 387	1.62	95	122	— 27	— 1.9
II	2	1 836	1.45	136	109	+ 27	+ 1.4
III	3	2 457	1.25	183	94	+ 89	+ 3.6
V	4	3 311	0.99	160	74	+ 86	+ 2.5

C. — Intensification of the total working capital.

I	over 14	3 507	1.16	109	87	+ 22	+ 0.6
II	13-14	2 565	1.54	181	118	+ 63	+ 2.4
III	11-12	2 094	1.17	152	88	+ 64	+ 3.0
V	9-10	1 730	1.78	129	134	— 5	— 0.2
VII	under 9	1 240	1.45	92	109	— 17	— 1.3

D. — Intensification of labour.

	up to 3	1 521	0.41	80	31	+ 49	+ 3.2
	4	1 658	1.00	134	75	+ 59	+ 3.5
	5	2 038	1.59	158	119	+ 39	+ 1.9
	6	2 382	1.76	144	131	+ 13	+ 0.5
	7-8	3 224	2.40	207	180	+ 27	+ 0.8

E. — General intensity.

	up to 12	1 368	1.33	87	100	— 13	— 0.9
	13	1 200	1.08	111	81	+ 30	+ 2.5
	14	1 328	1.10	119	83	+ 36	+ 2.7
	15	2 128	1.15	126	86	+ 40	+ 1.9
	16	2 101	1.31	147	98	+ 49	+ 2.3
	17	2 135	1.70	160	128	+ 32	+ 1.4
	18-19	2 387	1.70	167	128	+ 39	+ 1.6
	20-22	3 051	1.86	218	140	+ 78	+ 2.5
	over 22	3 849	1.45	182	109	+ 73	+ 1.8

The same is the case in the relations between degree of intensity and economic situation. Group III, consisting of farms already less favourably situated as regards economic position, shows that an increase of intensity is profitable only as far as the second degree of intensity, and in Group IV intensive farming is the most profitable.

In investigating the effect of the size of the farm, it appears that the smaller the extent of the farm, the later are the limits of the advantages of intensifying reached. It thus follows that the greater intensity given to a farm is a means of increasing the net returns only within the limits by its natural and economic situation.

From the point of view of the economic production of the country, the question has to be judged differently, inasmuch as there the increase of intensity is always connected with an increase of income, as is shown by Table G. Nevertheless, the interests of private and public economy go hand in hand, because more intensive farming is all the more capable of increasing net returns the better are the natural and economic conditions.

Thus when the whole country improves the economic conditions of agricultural production by facilitating and promoting agricultural improvements, etc., it makes a more intensive farming possible or facilitates it and thus renders itself the greatest service.

One crown = 10*d* or 20.3 c.; one hectare = 2.47 acre; 100 crowns per ha. = £1 13*s* 9*d* or \$ 8.21 per acre.

86 - Cost of Milk Production in Mexico. — BONANSER, SYLVIO in *Gaceta de Agricultura y Veterinaria*, Year 4, No. 7, pp. 1-3. Mexico, July 1, 1913.

The writer wishes to demonstrate that the sale of pure whole milk in Mexico at the price of 13.4*d* per gallon leaves no margin of profit, for the average cost of production of one gallon of milk is 13.1*d*.

This cost is calculated as follows:

Amortisation of the value of a cow, considering the average purchase price at £ 35 17 <i>s</i> 6 <i>d</i> , the average sale price at £ 5 25 6 <i>d</i> and the average period of milk yield at 5 years.			6	3	0
Interest on the capital invested in the cow.			2	3	0
Cost of feeding, 1 <i>s</i> per day.			18	9	0
Attendance, surveillance, taxes, implements, lighting, etc., 10 <i>s</i> 3 <i>d</i> per month.			6	3	0
Veterinary surgeon and medicines, 2 <i>s</i> per month.			1	4	7
Rent of buildings, 2 <i>s</i> per month.			1	4	7
Total.			£	35	7 2
Deduct the value of the calf.					10 4
Cost of production of milk per cow per year.			£	34	16 10

With a production of 2900 litres (638 gallons) of milk per year, the cost per gallon is 13.1*d*.

AGRICULTURAL INDUSTRIES.

1387 - **The Actual State of the Dairy Industry in Japan.** — Communicated by Dr W. YAMASHITA, Agriculturist to the Central Agricultural Experiment Station of the Empire.

The diet of the Japanese people consists largely of vegetable food, the most important part of which is rice. When animal food is used it consists principally of fish. In ancient times, cattle were very commonly slaughtered both for food and as sacrifice. On the introduction of Buddhism in the middle of the sixth century, the custom of eating animal food gradually died out, as it was considered a crime to take life. Cow's milk as food was already known 1200 years ago, but it was rarely used and only by the high classes. Cattle were generally reared only as beasts of burden and for tillage until the restoration.

Since then the Government has laid great stress on the improvement of cattle by the importation of foreign breeds, in particular Ayrshires, Holsteins and Brown Swiss, and now cross-breds are steadily increasing throughout the country. The breeding of pure foreign cattle is also engaged in, and these too steadily increase in number. The following table gives the number of foreign pure-breds kept for breeding purposes (dairy-cattle) in 1904.

	Cows	Bulls	Total
Ayrshires	1683	783	2466
Holsteins	1907	783	2690
Jerseys	100	37	137
Brown-Swiss	156	180	336
Simmenthals	27	38	65
Guernseys	5	—	5
French Canadians	9	4	13
Total	3887	1825	5712

As the above shows, the Ayrshires and Holsteins predominate; consequently the greater number of cross-breds in Japan have the blood of the two in them. The total number of cows at present kept in Japan is about 900 000. Of this number 50 000 are milch-cows fed exclusively for the dairy. The annual yield of milk from the dairies is about 10 000 000 gallons, corresponding approximately to 0.8 quart per head of population. In addition to this the farmers to some extent use milk from cows which are kept really for milking purposes; still, the total is very small when compared with the quantities consumed in European countries.

However, the consumption of milk is increasing in Japan, and the deficiency of supply is made good by the importation of foreign dairy products. The following table shows the quantities of condensed milk imported and that produced at home since 1904.

	Condensed Milk Imported — lbs.	Condensed Milk produced in the country — lbs.	Total — lbs.
1904	6 021 684	288 041	6 309 725
1905	8 324 012	272 348	8 596 360
1906	7 469 292	293 349	7 762 641
1907	10 017 172	288 284	10 305 456
1908	10 909 920	320 096	11 230 016
1909	10 610 592	—	—
1910	10 792 586	834 387	11 626 973
1911	9 125 064	1 200 046	10 325 110

Condensed milk is imported into Japan from England, Germany, Switzerland, Austria-Hungary, Norway, the United States of America, Canada, etc.

Dairies in Japan are usually in the neighbourhood of cities or towns and do not keep a large number of cows. Immediately after milking the milk is filled into small bottles. In these it is sterilized at above 80° C. in a small sterilizer heated by steam, and this milk is distributed to the consumers daily every morning.

The condensed milk is prepared from milk supplied by farmers in factories owned by co-operative associations; in these the vacuum pan is made use of. The factories are as yet few in number; they are, however, expected to increase gradually.

The demand for butter is growing; the appended table gives the quantities imported and produced in Japan since 1906.

	Butter imported — lbs.	Butter produced — lbs.	Total — lbs.
1906	157 113	55 236	212 349
1907	153 968	45 148	201 116
1908	129 597	—	—
1909	125 546	153 410	278 956
1910	129 874	230 639	360 513

Butter is imported from England, Germany, France, Belgium, Italy, Austria-Hungary, Holland, Russia, Denmark, the United States of America, Canada, Australia, etc. In Japan it is commonly made on a small scale by milk dealers, but within the last few years small creameries have been organized by farmers on the co-operative system. Here butter is made and skimmed milk is used for feeding calves.

Oleomargarine is also imported from foreign countries, but the quantity is decreasing; the method employed in making oleomargarine in Japan is very primitive.

The demand for cheese is still very small. Since 1903 the quantities imported and produced in this country have been as follows:

	Cheese imported	Cheese produced	Total
	lbs.	lbs.	lbs.
1903	55 524	—	—
1904	96 764	—	—
1905	64 992	—	—
1906	55 081	—	—
1907	49 006	—	—
1908	45 262	—	—
1909	46 464	11 450	57 914
1910	44 884	15 181	60 065

Dairy farmers use common grass and rice straw for the feeding of dairy cows. This is due to difficulty of cultivating meadow grass profitably. Though sometimes corn-silage is used on the American system, the supply of coarse fodder has proved generally unsatisfactory. Of concentrated fodder wheat-bran, rice-bran and *tofu* cake (*tofu* is vegetable casein made from soya-beans) are the most important. Lately, soya-bean cake, which is largely imported from Manchuria as manure for rice culture, is taking the place of wheat-bran as food for cattle.

Regarding the sanitation of dairies, two laws have been promulgated the first to prevent the spreading of contagious diseases, the second to prevent the spread of tuberculosis in cattle. Cattle plague is kept in check in Japan by very rigorous measures. The inspection of tuberculous animals is made by the tuberculine-test and seriously diseased animals are slaughtered.

The sale of milk is regulated according to rules made by the Department of the Interior. The specific gravity, fat content, etc., are prescribed and the sale of unwholesome milk from diseased animals is prohibited.

1388 - **Reindeer Milk and Reindeer Cheese.** — BARTHEL, CHR. and BERGMAN M. ARVID in *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel sowie der Gebrauchsgüter*, Vol. 26, Part 5, pp. 238-241. Berlin, September 1, 1913.

Milk. — Reindeer milk when freshly drawn is of a thick, creamy consistency and possesses a pleasant smell and taste. On keeping, the fat becomes rancid, the smell pungent and the taste unpleasantly sour. The Japps always dilute it with a third or a half of its volume of water before drinking it. Undiluted it is used as cream for coffee. Butter is seldom prepared from it, but more frequently cheese, or a kind of dense milk in which leaves of *Rumex*, *Archangelica* and sometimes also *Mulgedium* are mixed. In order to keep it, the milk is left to freeze or to acidify spontaneously.

The percentage composition of the milk according to several analyses made by the writer is the following:

water	Protein (1)	Fat	Milk sugar	Ash
63.30	10.30	22.46	2.50	1.44

(1) Nitrogen \times 6.37.

In the ash the following percentage was found :

K_2O	Na_2O	CaO	MgO	P_2O_5	SO_2	Cl
14.64	16.20	35.28	2.72	30.44	1.68	4.17

The diameter of the fat globules averages 5 μ , but ranges between 1 and 14 μ .

The figures given by the writer agree with those found by Fleischmann and Pandnitz, except for fat content, which the latter found about 5 per cent. lower.

Cheese.—Reindeer's milk cheese is a fat hard cheese curdled with rennet, which in the Lapland Marches of Västerbotten is made in round shapes out 2 inches high and weighing about 1 pound; the top and bottom of the cheeses are flat, the sides are rounded off. The rind is thin and the texture of the cheese is compact but fissured. Round the fissures the mass is yellow; the rest is white, but it turns yellow immediately it is cut.

The rind has a pungent taste; the cheese itself has the fine aroma of reindeer milk and melts in the mouth. It may, however, become rancid; has then a strong smell and an acrid taste. The cheese is mostly used by the Lapps as an adjunct to their coffee.

On analysis the cheese showed the following percentage composition:

Water	Protein and derivatives	Fat	Other organic matter	Ash
28.31	22.57	44.02	2.20	2.40

The total nitrogen is divided into: soluble N, 43.46 per cent.; decomposable N, 12.24 per cent.; ammoniacal N, 1.58 per cent.

For the fat constants the following figures were found:

Köttstorfer's saponification value	226.1
Reichert-Meißl number	34.6
Polenske's number	1.1
Iodine value (according to Hübl)	23.3
Refractometer reading at 40°	41.4

The saponification value and refractometer reading agree with the constants for cows' milk, while the Reichert-Meißl number is higher and Polenske's and the iodine values are lower.

89—**Lobeck's Biorisator Process** (1).—FREUND, W. In *Molkerei-Zeitung*, Year 27, No. 77, pp. 1489-1491. Hildesheim, October 3, 1913.

The writer reports upon a trial of the milk sterilization process recommended by Lobeck carried out on behalf of the Association of the Large Milk Purveyors of German towns. In Germany hitherto two dairies have set up biorisators, one at Düsseldorf and the other at Leipzig. The Düsseldorf plant, which is erected on the dairy premises, can deal with 220 gallons per hour, while the biorisator placed in a shed adjoining the Leipzig dairy

(1) See No. 743, B. June 1913 and No. 1190, B. Oct. 1913.

treats 55 gallons per hour. No tests were made as to the consumption of steam, but it appears to be low in both plants. The examination of the milk by the writer showed that in both dairies when the biorisator worked normally it did not cause any alteration in the milk as to appearance, colour, smell, taste or capacity of separating cream. The peroxydases also remain unchanged, though catalase and reductase suffer a slight reduction. Coagulation is somewhat delayed, but nowise impaired. The vegetative forms of bacteria, with the exception of individual specially resistant spores of earth and hay bacteria, are killed. All pathogenic germs are certainly destroyed by the biorisator. Biorised milk contains no albumen coagulum and possesses the same fat globules as raw milk. It is considerably superior to raw and pasteurized milk in its keeping qualities. The writer is convinced by the results of the test and by the impression received during the inspection of the installation that this process is really capable of accomplishing what is claimed for it.

1390 - **Control of Butter Yield.** — HESSE, H. in *Molther-Zeitung*, Year 27, No. 66, pp. 1321-1322. Hildesheim, September 3, 1913.

The writer illustrates two formulae on the basis of which he has recently worked out nine tables for the calculation of the yield of butter from cream.

The formula for the calculation of the butter yielded by cream is the following :

$$\text{Yield of butter} = \frac{a(b-c)}{d-c}, \text{ in which:}$$

a = the quantity of cream churned

b = the fat content of the cream

c = " " " " " buttermilk

d = " " " " " butter

1391 - **The Scientific Basis of Cheese Making and the Use of Artificial Rennet in the Manufacture of Emmental Cheese.** — ALLEMANN, O. in *Landwirtschaftliches Jahrbuch der Schweiz*, Year 27, Part 5, pp. 325-361. Berne, 1913.

The writer reports upon careful experiments conducted at the Dairy and Bacteriological Institute at Liebefeld, near Berne, with the object of throwing more light upon the scientific basis of cheese making and especially upon the question of the advisability of using artificial rennet in the making of Emmental cheese. The nature of artificial and of natural rennet was studied, as well as the value of both rennets by means of comparative experiments in cheese making (with and without starters); the questions of milk coagulation, the working up of the curd before and after cutting, the processes which take place in the curd under the press, the treatment of cheeses during ripening and the valuation of results were also dealt with.

As to the rennet to be used in the manufacture of Emmental cheese, it was found that the natural rennet made by the cheese makers and the rennet powder called artificial rennet do not differ much in their action. With the exception of the fact that natural rennet is somewhat richer in

lactic acid bacteria, it is nowise superior to the artificial product. In order to avoid the many injurious bacteria which are often present in natural rennet, it is advisable to treat it with acids, or with pure cultures of lactic acid bacteria. On the whole, however, it would be better if the Emmentaler cheese makers were to give up natural rennet altogether in favour of the commercial rennet powder, duly combined with cultures of lactic acid bacteria. Experiments in this direction carried out at the Liebfeld Institute during several months have shown that cheeses made with artificial rennet and pure cultures of lactic acid bacteria are not inferior to those made with natural rennet and pure cultures of lactic acid bacteria.

12 - **Synthetic Milk Production from Soya Beans in Liverpool.** — *The Chemical World*, Vol. II, No. 10, pp. 332-333. London, October 1913.

A factory for the making of synthetic milk from soya beans and other ingredients is shortly to be established in Liverpool. Soya beans contain 40 per cent. of "soluble casein" under conditions which admit of its ready utilization for the making of milk, which, as regards nutriment, is claimed to be equal to cow's milk, having a fat more easily assimilable than that of the latter. The company projecting to establish a factory in Liverpool is the "Synthetic Milk Syndicate, Ltd.," London, and they will work according to Dr. Fritz Gössel's process (of Stockheim, Essen, Germany). For the production of 100 litres of milk the procedure is as follows: about 1 kilos of finely ground soya beans (or earth or pistachio nuts, or sesame seeds or mixtures of same) are mixed with about 100 litres of water and a small quantity (about 5 gms.) of phosphate of soda or potash or the like, allowed to stand about an hour, and then slowly brought to the boiling point and only just allowed to boil; the liquid is then suitably filtered and the residue pressed after it has been cooled to about 50° C. About 2.4 lbs. of milk sugar or other suitable carbohydrates, about 6 gms. of sodium carbonate and 60 gms. of carbonate of soda are dissolved in the liquor run off, and about 2 kilos. of sesame oil or any other suitable mixture of fats or oils is mixed with the solution. The milky liquor obtained would be brought to the volume of 100 litres by the addition of pure water. The "milk" can be manufactured at a cost which will admit of its being sold to dealers at 2 d per quart.

PLANT DISEASES

GENERAL INFORMATION.

1393 - **Importation of Vines into Roumania.** — Extract from *Moniteur commercial roumain*, Oct. 1, 1913, in *Feuille d'informations du Ministère de l'Agriculture*, Year No. 41, p. 1. Paris, October 21, 1913.

The Minister of Agriculture and of the crown-lands of Roumania has issued the following decree to take effect in the autumn of 1913: All American grafts and vines of every kind entering Roumania must be accompanied by a certificate of origin, independent of the importation permit granted by the Ministry. This certificate must indicate: a) the place of origin, the commune, district and nursery in which they were grown; b) the name of the nurseryman sending the stocks, and the name of the receiver; c) the name and nature of the stocks; d) the frontier town from which they are sent into Roumania.

The certificate of origin must be legalised by the communal authority in the place of production as conforming to the declaration contained therein.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

1394 - **On the Pathological Significance of the Endocellular Fibres in the Stem of the Vine** (1). — PETRI, L. in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Serie V, Vol. XXII, Second Half-year, Part 4, pp. 174-179 + fig. Rome, 1913.

The author asserts that the characteristic symptoms of "branched leaf" are always preceded for a year or more by the formation of endocellular fibres. In vines on their own roots which become slowly diseased there exists what may be called an incubation period during which the plant appears healthy externally, but possess endocellular fibres in the tissues of the stem. In the nurseries of Sicily it is easy to find stocks with numerous

(1) See No. 1207, B., Oct. 1913.

growth, yet containing numerous endocellular fibres. They can be distinguished from really healthy vines only by the later development of the buds and the more vigorous growth of the suckers. The latent pathological condition can be determined by grafting healthy shoots of *Vitis vinifera* to them, or better still by propagating cuttings. The disease appears in the course of the first or second year in the cuttings or in the grafts.

According to the writer, a vine with endocellular fibres in its young shoots does not necessarily become permanently attacked by the "bramble-leaf" disease. In previous works he has shown that healthy vines exposed to cold in spring may form endocellular fibres, with or without shortening of the internodes and perforation of the leaves, without being really diseased. In bearing vines, the damage is always confined to the one season, and if the new buds do not suffer from late colds in the following year, they develop normally. With vines grown for cuttings, however, the effect of late colds the year's shoots is more serious, even if they show normal development. Cuttings obtained from such shoots, either in the nursery or planted out, show a low percentage of rooting. Those which do take root show the presence of endocellular fibres in the side roots; for this reason, grafts on these stocks also frequently develop the symptoms of "bramble-leaf". Consequently the writer considers that vines showing the presence of these fibres are diseased, or at least show a latent pathological condition in the organs in which such cytological anomalies occur.

In order to remove any doubt as to the chance coincidence of the presence of these threads and "bramble-leaf" disease, the writer conducted experiments to determine what degree of disease could be attributed to physiological disturbance of the active cambium cells, when, under the action of cold, they produce these fibres. In February 1913 he cut at the base shoots of a vine which had been exposed to cold in the previous year and which showed the endocellular fibres, as well as control shoots; the two series of shoots were planted in pots and kept under the same conditions. The control shoots rooted and produced normal shoots, but the others did not develop roots and their buds soon withered.

This does not prove that there is any genetic relation between the formation of fibres and "bramble-leaf", but it shows that the shoots with the abnormal cell-contents are not healthy. Consequently in the substitution of vineyards, it is necessary to discard as far as possible the plants showing endocellular fibres in their wood.

The writer records that the repeated cold spells of the spring of 1913 had a very serious outbreak of this abnormal cell condition even in the shoots at the base of the plants. It is not the position of the shoot which determines its resistance or otherwise to the effects of cold, but rather its cellular stage of development at the time.

The writer also confirms the fact that these fibres occur in the higher internodes only in vines that have been diseased for some time. The cambium in these internodes very rarely develops this abnormal condition, and such growth takes place when the period of spring colds is past; only when cold snaps occur very late that the cambium of the upper

internodes can produce fibres. Such cases are naturally exceptional and are of no value in diagnosing the extent of the disease. It is different, however, with shoots of vines which have shown the formation of fibres in several years. In such shoots, fibres may develop in the internodes independently of the direct influence of cold. Consequently the development of fibres in the apical region of shoots has a pathological significance which is dependent on the presence of fibres in the woody tissues of the stem.

BACTERIAL AND FUNGOID DISEASES.

1395 - Experiments on the Susceptibility of the Oak to Mildew. — RIVERA, V. CENZO in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, Second Half-year, Part 4, pp. 148-7. Rome, 1913.

The writer has conducted experiments with seedlings of three varieties of *Quercus Robur* growing in culture media and in soil, in order to determine the influence of the age and turgidity of the leaf and the rate of root absorption and nutrition of the leaf on the susceptibility to mildew. Experiments have also been made on the infection of immune leaves.

As a result of these experiments it has been found that the full-grown leaves of the oak are resistant to the disease, while young leaves in an active state of growth are attacked, the degree of susceptibility being proportionate to the rapidity of growth. This explains why the fresh shoots of potted trees, trunk shoots and suckers are so susceptible. Young growth leaves kept at even maximum turgescence in moist air do not get attacked though conidia germinate on them very readily. Loss of turgidity due to high temperatures is an important factor determining infection. The concentration of the culture solution (Knop's solution) also influences the susceptibility of the leaf, because in pure water as well as in concentrated solutions, growth is arrested and immunity established.

Leaves completely etiolated are not susceptible, while those only partially etiolated are attacked in different degrees, those grown in a light being less susceptible. Direct sunshine appears to hinder infection. Inorganic salts do not appear to exert any direct influence on susceptibility. In the experiments with resistant leaves, variations in turgidity were not successful in bringing about infection.

1396 - Diseases and Pests of Cereals in 1912. — RIEHM, E. in *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Part 2, Vol. 39, No. 4-7, pp. 107. Jena, 1913.

A review of the most important work published during 1912, comprising the following:

- 1) Diseases and non-parasitic disturbances.
- 2) Weeds and fungi (*Ustilagineae*, *Uredineae*, *Fusarium*, straw blight and other fungoid parasites).
- 3) Animal pests (insects, birds and mammals).

A list of 134 publications quoted in the text is appended.

97 - *Rhabdospora alexandrina* n. sp., parasitic on Berseem (*Trifolium alexandrinum*) in Algeria. — CHRISTIAN, J. and MAIRE, R. in *La Revue de Phytopathologie appliquée*, Vol. I, No. 9, pp. 125-129, figs. 1-6. Paris, October 5, 1913.

Trifolium alexandrinum has been grown with success during the last three years at the School of Agriculture, Maison Carrée (Algiers). In December 1912, a disease, characterised by irregular black spots on the stems and round brownish spots scattered on the surface of the leaves, appeared and spread rapidly over an area of more than 2 acres. Fructifications of the fungus develop readily on the diseased patches on the stems, but rarely on the leaves. The writers consider this fungus to be a new species and describe it as *Rhabdospora alexandrina*, allied to *Septoria completa* Sacc. which attacks the leaves of *Trifolium alpestre* and *T. incarnatum* and differing from *R. trifolii* Ellis. Pure cultures of the fungus have been obtained.

The damage of the infested plots due to this fungus amounts to more than half the crop. The rapid spread of the disease has apparently been favoured by the rather impermeable nature of the loamy soil and repeated watering of the crop. Consequently the writers do not consider the disease liable to become an epidemic and endanger the cultivation of this clover.

As precautions against its spread, they recommend a suitable rotation and drainage of the soil. Spraying with copper sulphate after harvesting the crop has given decidedly beneficial results. The best means of limiting the damage would be to cut the crop early before it has been much injured.

98 - *Passalora Heveae* n. sp., a Leaf Disease of *Hevea brasiliensis* in British Guiana. — BANCROFT, C. K. in *The Journal of the Board of Agricultural of British Guiana*, Vol. VII, No. 1, pp. 37-38. Demerara, July 1913.

The writer records a new leaf disease on Hevea observed recently amongst nursery trees. It is characterised by spots, increasing in size and forming dry areas, which ultimately become holes. The fungus causing the disease is said to be a new species, and is described as *Passalora Heveae* Massee.

It seems advisable to destroy all the affected leaves before planting out. Spraying with lime-sulphur is recommended for the nurseries, as it will also serve to destroy insects.

99 - *Oidium Agatidis* n. sp. and *Cercospora Agatidis* n. sp., Parasite on *Agati grandiflora* (1), an Ornamental Leguminous Plant from Cochinchina. — FOEX, E. in *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 3, pp. 348-352, figs. 1-3. Paris, 1913.

On leaves of *Agati grandiflora* from Cochinchina, the writer found irregular brown spots and minute black points. A water-colour drawing sent by the material shows that in the fresh state some of the leaflets show minute web-like covering suggesting the presence of a mildew. In sec-

(1) In the *Index Kewensis*, *Agati grandiflora* Desv. is referred to the genus *Sesbania*. (Ed.).

tions, the writer has found an *Oidium* which he provisionally describes as *O. Agatidis*.

The black points are due to a new species of *Cercospora* which he calls *C. Agatidis*.

1400 - **Cucumber Leaf Spot (*Corynespora Mazei*) in Germany.** — ALTMEYER in *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year 9, pp. 109-112, Stuttgart, 1911.

Cucumber leaf-spot (caused by *Corynespora Mazei*), though well known in England since 1896 and in Holland (where it is called "bladwour" since 1905, was first recorded in Germany at Hamburg in 1909, since when it has reappeared sporadically. The writer found it recently on some cucumber leaves received from Swabia and the Palatinate. It was probably introduced into Germany in seed bought from England and perhaps also in the cucumbers which are imported from England in large quantities each spring.

The disease first appears on the leaves as small spots about the size of a pin's head, conspicuously scattered over the entire leaf; these spots grow rapidly, forming dry patches and in about 7 or 10 days the entire plant may be destroyed. It is probable that a slight weakening of the plant predisposes it to infection; the rapidity of the destruction may then be accounted for by the susceptibility of cucumber plants to conditions of temperature, ventilation, soil and manure, and also by the rapidity of growth of the fungus.

Experiments on the disinfection of seed from the infected district show that immersion for 24 hours in a 2 per cent. solution of copper sulphate does not interfere with their germination. The writer believes that a solution of corrosive sublimate may be useful.

The experiments (not yet completed) on the treatment of the disease by spraying various solutions, including copper-soda mixture, copper sulphate and other substances, afford no results of value.

The writer recommends a trial of basic slag and potash salts.

1401 - ***Asperisporium Caricae* and *Sphaerella Caricae* Parasitic on the Leaves of *Carica Papaya* in Brazil.** — MAUBLANC, ANDRÉ in *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 3, pp. 353-358, plate XXXI, Paris, 1913.

In the Rio de Janeiro district of Brazil, the leaves of the Papaw (*Carica Papaya*) are often attacked by a disease which appears on the upper surface as round or irregular spots 1 to 4 mm. in diameter, at first pale yellow surrounded by a broad brownish border and changing to a glistening white; on the underside of the leaf the patches quickly become covered with numerous brownish-black points, often arranged in concentric circles, and which ultimately cover the whole surface of the patch. Examination under the microscope shows that these black spots are the conidial stage of a fungus known in other countries on the same host, and described successively as *Carispora Caricae* Speg., *Scolecotrichum Caricae* Ell. et Ev., *Epichinium Cumminsii* Massee, *Pucciniopsis Caricae* Earle and *Fusicladium Caricae* (Speg.) Sacc; the writer considers it belongs to a new genus of Hyphomycetes, which he

mits under the name of *Asperisporium*, so that the fungus becomes *Caricae* (Speg.) Maubl.

The writer has also observed, on the upper surface of the older patches of the leaves, the formation of small black perithecia, which he considers to be the perfect form of *A. Caricae* and describes as new under the name *Sphaerella Caricae*.

RASBITIC AND OTHER INJURIOUS FLOWERING PLANTS.

1 - *Cuscuta arvensis* and its Hosts. — D'IPPOLITO G. in *Le Stazioni sperimentali agrarie italiane*, Vol. XLVI, Part 7-8, pp. 540-549. Modena, 1913.

The writer sowed seeds of *Cuscuta arvensis* Beyrick with clover in a pot; at a time he observed that the parasite had spread out of the pot and had attacked various weeds growing along a road adjoining for a distance of more than 20 yards; these weeds were *Rumex pratensis*, *R. crispus*, *Mercurialis annua*, *Sonchus oleraceus*, *Sinapis arvensis*, *Solanum nigrum*, *Urtica ca*, *Chnicus arvensis*, *Lactuca Scariola*, *Polygonum aviculare*, *Setaria verticillata* and *Matricaria inodora* (1).

Subsequently the writer placed fragments of *Cuscuta* on the lower part of the stems of two poisonous plants, *Conium maculatum* and *Delphinium thysagria*. He found, the day following the infection, that the parasite already firmly attached itself to its host, which together with the parasite continued to develop normally. In the stems of *Conium* and *Delphinium* it was found that some of the cells containing the alkaloid had been broken into by the haustoria of the *Cuscuta*.

1 - *Xanthium ambrosioides*, a New Composite Weed in New South Wales. — MALDEN, J. H. in *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 9, p. 774. Sydney, September 1913.

This weed, indigenous to Chile, has appeared near Jerilderie. It bears some resemblance to *X. spinosum* (2), but differs from it in its spreading habit, small deeply-divided leaves and grey colour. Every effort has been made to exterminate the weed, but it still threatens to become a serious nuisance. With a view to preventing its reappearance, it is important to determine the source of introduction.

INSECT PESTS.

1 - *Tetrastichus giffardii* n. sp., a Chalcid Parasite on Species of *Ceratitis* and *Dacus* in West Africa. — SILVESTRI, F. in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, Second Half-year, Part 5, pp. 205-206. Rome, September 7, 1913.

The author gives a description of a new species of *Tetrastichus* which he found in Nigeria as a parasite of *Ceratitis stictica* Bezzi and *C. giffardii*

(1) In this connection see No. 1298, B. Nov. 1913.

(2) See No. 2029, B. June 1911.

(Ed.).

(Ed.).

Bezzi; later he obtained it also from pupae of *Dacus cucumarius* Sack in Kamerun, from pupae of *Ceratitis* on the Gold Coast, and again from *C. giffardii* in Dahomey.

This parasite passes its last larval stage and pupates in the pupae of fruit flies of the genera *Ceratitis* and *Dacus*. He obtained as many as 15 to 34 individual parasites from a single infested pupa.

The parasite deposits its eggs in the eggs of its host, or in the young larvae just hatched, but not in the full-grown larvae and pupae. It is not yet known whether the female lays a single egg which becomes a polyembryo, giving rise to numerous individual parasites in the pupa, or whether it lays several eggs in one host insect.

1405 - *Injurious Insects in German East Africa.* — MORSTATT, H. in *Der Pflanzer*, Year IX, No 6, pp. 288-296. Darussalam, 1913.

The writer gives a list of 170 injurious insects so far recorded in the colony. After the scientific name of each insect, is given the plant or vegetable product it attacks, also references to publications relating to the insects. The common names of some species or families are given.

1406 - *Hypsopygia costalis*, Injurious to Lucerne Hay in the Romagna, Italy. — SAROZZI, DINO in *L'Italia Agricola*, Year IV, No. 18, pp. 444-451, 1 picture. Piacenza, 1913.

Hypsopygia costalis Fab. has been recognised since 1902 as being injurious to lucerne hay in Central Italy; it has now begun to attack lucerne hay in the Romagna, where it is known as "tarlo" or "tignola". The larvae destroy the leaves almost completely, leaving only the stems with a few petioles. Attached to these are numbers of silky threads with cocoons containing pupae, and the excreta and cast-off skins of the larvae. The fodder is thus badly damaged.

In an average attack, or when the hay does not consist entirely of lucerne, the loss is at least 20 per cent., but it may reach 50 or 60 per cent.

The writer explains the life-history of the insect, and mentions that the poultry eat the larvae greedily; they may thus be used to destroy them when the hay is shaken out before being fed to stock. Many of the larvae, carried into the stables with the hay during winter, are destroyed by spiders. It is also not uncommon to find larvae and pupae attacked by microscopic parasites not yet identified, and also by Braconids. Carbon bisulphide has not been found effective for disinfecting hay-stacks. The writer recommends that when a stack is attacked it should be used up as soon as possible to prevent the development of the larvae. Hay to be chaffed should first be carefully shaken out so that the larvae falling can be picked up by the poultry. The fodder can be made more acceptable to cattle by moistening with salt water, provided it is not too mouldy. Some larvae, however, will escape and hibernate in the stable. These should be destroyed by carefully cleaning the walls and ceiling, particularly the crevices towards the end of April, the cocoons swept out being burnt. The stable should then be sprayed with a solution of formaline and white-wash.

The spread of this insect is accounted for by its well known habit

ing able to live on any dried refuse. The presence of adults in hawthorn edges in May suggests that it feeds on the dry leaves of this plant. Thus can easily attack neighbouring crops of sulla and, owing to its rapid propagation and the favourable hibernating conditions offered by the stacks, has become a specialised pest of this plant. Once the insect has become adapted to these conditions, it is easy for it to adapt itself to other Leguminosae, such as lucerne.

7 - **Insects Injurious to Sugar-Cane in British Guiana and their Natural Enemies** (1). — BOOKIN, G. E. in *The Journal of the Board of Agriculture of British Guiana*, Vol. VII, No. 1, pp. 29-32. Demerara, July 1913.

The writer gives a list of 32 species of injurious insects, most of them known from other regions, with common names and natural enemies some.

8 - **Phricodus hystrix**, a Bug attacking Sesame. — DISTANT, W. L. in *Bulletin of Entomological Research*, Vol. IV, Part 2, p. 143. London, September 1913.

Phricodus hystrix Germar (= *Aradus hystrix* Germ., *Phricodus hystrix* in., *Stenotoma desjardinsii* Westw., *Phricodus fasciatus* Sign.) has been found in South and Central Africa, Madagascar and Mauritius. It is now recorded at Coimbatore (Southern India), on sesame (*Sesamum indicum* L.) it is probably a recent introduction there.

9 - ***Solanophila paenulata*** ("Vaquita de los melones"), Injurious to Cucurbitaceae in the Province of Mendoza (Argentina). — REED, CARLOS S. in *Agronomía*, Year IV, Vol. II, No. 17-18, pp. 194-197. Buenos Aires, 1913.

This insect, which is found abundantly on melons, lives also on other cucurbitaceae (pumpkin, watermelon, cucumber, etc.) The larvae are voracious and cause the appearance in spring of circular spots, 2 cm. diameter, on the leaves; later the tissues are devoured completely, so that spots become holes.

The writer describes the life-history of the insect, which appears to have no natural enemies. He observes that it is particularly susceptible to the action of insecticides, and further that it remains exposed on the plants throughout its life-history, being particularly active during the day. It is therefore easy to control.

It frequently happens that these plants are attacked at the same time by aphids and *Solanophila*. The writer recommends spraying in December with an emulsion of ordinary soap and kerosene oil. The 3 per cent. extract of tobacco did not give good results. A mixture of aceto-arsenite of copper (1 gram per litre of water) and 1 gram of lime was found most effective. The spraying should be repeated every 10 or 15 days until the insect disappears. The most practical method of control which does not cost much is collecting the larvae in the morning when they are torpid, either by shaking the plants over or by stretching underneath or by hand-picking.

(1) See also Nos. 438-440, B. Feb. 1912.

- 1410 - *Eleodes omissa* var. *borealis*, Injurious to Fruit-Trees and Watermelons in California. — ESSAO, E. O. In *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, p. 627, fig. 356. Sacramento, California, August 1913.

During May and June 1913 *Eleodes omissa borealis* (Tenebrionidae) was reported in various districts in California, as causing considerable damage to oranges and watermelons. In one orchard a large number of apricots and plums were completely destroyed by these insects. They appeared in such numbers as almost completely to cover the ground below the infested trees. Poisoned bran was found of little use, since the insect prefers to feed on the plants. Spraying with poisonous solutions gave better results. It is very probable that the appearance in such large numbers of this insect was due to the abnormally dry season.

- 1411 - The Prune Aphis (*Aphis prunifoliae* Fitch) in California. — ESSAO, E. O. In *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, p. 624, fig. 355. Sacramento, California, August 1913.

The appearance of this aphid was recorded in June 1913. Since then the aphid has been recorded from many sections of the Sacramento valley and has caused alarm to some of the prune growers. The louse is light green in colour and is covered with a rather thick coating of fine white powder which at once distinguishes it from all other lice attacking the prune. It attacks the tips of the twigs and collects in exceedingly large colonies especially upon the under sides of leaves, which are slightly curled by the work.

In May 1913, the larvae of Syrphid flies and internal Hymenoptera parasites were in sufficient numbers to indicate that the pest would be subdued before it did any great amount of damage. In a few sections, however, control measures were found necessary; these consisted in the application of a spray composed of nicotine sulphate in the proportion of 1 to 1500. A coarse driven spray under high pressure is necessary to force the liquid through the powdery waxy coating secreted by the insect.

- 1412 - *Mytilaspis cocomytilus dispar* n. sp. and *Diaspis taxicola* n. sp., Scale Insects observed in Madagascar and Algeria respectively. — VAYSSIÈRE, P. In *La Revue de Phytopathologie appliquée*, Vol. I, No. 9, p. 124. Paris, October 5, 1913.

Description of two new species. The first was found in large quantities on a branch of *Manihot* from Madagascar, and the second occurred on yew (*Taxus baccata*) in the Atlas of Blida, Algeria.

